INTRODUCTION

TO

BOTANIC TEACHINGS

AT THE

SCHOOLS OF VICTORIA.

BY

BARON FERD. VON MUELLER,

C.M.G., M. & PH.D., F.R.S.,

GOVERNMENT BOTANIST.

MELBOURNE:

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REFERENCES TO LEADING NATIVE PLANTS;

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PREFACE.

In submitting the following pages as the first means for introducing the study of plants into our elementary schools, it is incumbent on the writer to explain the reasons, which induced him to adopt for his little work the present form, more particularly as the method of treating his subject deviates widely from the ordinary plan of school-books written for botanical teaching. An experience of nearly forty years has convinced the author, that the use of a grammar-like publication for initiating into a study of plants is alike wearisome to the teacher and children, and that as a rule, subject to rare exceptions, the knowledge acquired from the ordinary first elementary works on Botany is as quickly lost as gained. The only method of rendering such studies agreeable and lastingly fruitful consists in arousing an interest of the young scholars in the native plants of their locality, to afford them all possible facilities to recognise and discriminate all the various plants within reach, to lead them by observations thus started to comprehend the limits of specific forms, of generic and ordinal groups, and to conduct them afterwards to the more difficult study of special anatomy and physiology of plants. The writer had therefore commenced, under the title of a "Victorian School-Flora," a work descriptive in the plainest words of all the plants indigenous within the limits of the colony, so that every tree, shrub, herb, rush, grass or fern might with comparative ease be recognised from brief descriptions

and from additional leading xylographic illustrations. The commenced work would enable any child of average mental capacity, even without the aid of a teacher, to name and classify a large number of local indigenous plants, would encourage the formation of collections, would lead to reflecting observations and cheerful recreation, without encroachment on the time needed at school for acquiring that first particular and general education, more imperative for the practical daily requirements of subsequent life. Furthermore the work would not only have proved a guide at educational establishments, but would as well have conveyed instructions and means for extensive references to all classes of our community. The path here indicated for the study of plants from the indigenous flora is the only one, which without unproductive sacrifice of time can be followed, and which leaves knowledge permanently on the memory. Moreover native plants afford in any locality and at any season ready material for instruction, while even the most ordinary garden-plants are not at all times and at every spot available for illustrative purposes. Nevertheless a work, devoted to the vegetation of a country as large as England and Scotland taken together, must necessarily assume the dimensions of several hundred pages, even if descriptive details are reduced to the extremes of briefness compatible with clearness, and even if all needless or avoidable scientific terms are banished from the pages of such a work. The first part of the School-Flora, one complete in itself, was written and ready for comparatively cheap issue ; but on Ministerial request the author was induced to postpone the more extensive work on the native flora, in order that a smaller publication on Gum-trees, Wattles and other leading plants of ours should take precedence, according to the wishes of his superiors ; and he was furthermore requested to abandon as much as ever possible scientific terms, names and appellations for the primary work now to be offered. In a first

attempt of placing a botanic school-book on such a basis, and in a first endeavor of reducing it at the same time to a very limited number of pages, it was not found easy to draw the lines of demarcation of the various subjects, which a book like the present may fairly be expected to touch on in an attractive form. Should the plan, adopted on this occasion, prove to answer the intended purposes, then one or more additional parts might follow, unless the contemplated larger work was brought out so early, as to render further exertions in the direction now indicated for this particular teaching here unnecessary. Those, who wish to use for instruction or study such special works, as are generally adopted in Britain, can have no difficulty to select even here from quite a host of purchasable publications, all meritorious in their way, some quite inexpensive, and on most of which we could not hope to improve extensively; while in cheap profuseness of artistic illustrations the colonial publications could not possibly yet compete with home works. The teacher in utilizing now the present pages will find it convenient, to adopt each of the short chapters for one or more separate lessons, and to supplement by any additional material within his reach the means for demonstration, preserving the plants, thus brought together, for a local school-collection, to serve permanent references. The illustrative figures of this little book are chiefly copied from the plates of the "Plants of Victoria," drawn under the author's supervision. The anatomic drawings are original. To foster the knowledge of our native vegetation the author undertook since three years, to send out pressed and dried plants with printed notes in atlas-form under the title of "Educational Collections," the fascicles of which are accessible in the mechanic institutes and free libraries of each district, whereby an easy additional opportunity for local investigations by mere comparisons is offered. The writer moreover has ever been willing to promote by correspondence or

otherwise any scientific enquiries concerning plants, particularly in all instances, when local literary means were insufficient, to clear up any doubts or to indicate the way for further progress to those, who by taste and natural inclination desired to engage on more extended phytologic studies.

Melbourne, March 1877.

I.—THE EUCALYPTUS TREES

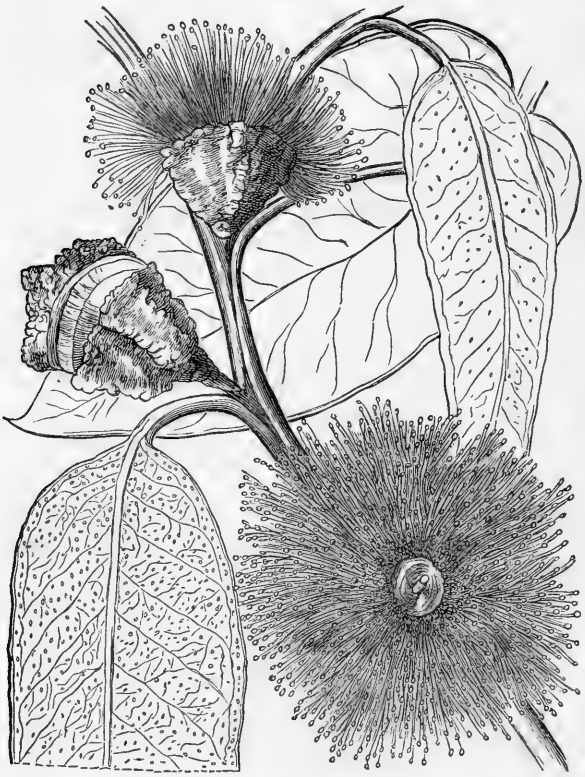
AND ALLIED PLANTS.

The so-called Gum-trees constitute the main timber-vegetation of the whole Australian continent. From among them the "Blue Gum-tree" has been chosen in first instance for consideration, because it is widely distributed through several districts of the colony of Victoria, more extensively cultivated than any other Eucalypt, and thus within easy reach of observation in almost every locality. The vernacular name of Gum-trees for the Eucalypts is as unaptly given as that of most others of our native plants, on which popular appellations have been bestowed. Indeed our Wattles might far more appropriately be called Gum-trees, than the Eucalypts, because the former exude a real gum (in the chemical meaning of the word); whereas the main exudation from the stems and branches of all Eucalypts hardens to a kino-like substance, contains a large proportion of a particular tannin (kino-tannic acid), and is to a great extent or entirely soluble in alcohol, thus very different from genuine gum. But the Eucalyptus-kino is soluble in boiling water, and therefore neither a truly resinous but an extractive substance. This kino is valuable not less as a medicinal drug than as a material for tanning and dyeing; hence it has become a remunerative article for trade and export.

The Blue Gum-tree was already rendered known in the year 1792, when it was first noticed by La Billardière, the naturalist of the expedition, which under Admiral D'Entrecasteaux was sent in search of the missing ships of Count Lapérouse. The French Explorers discovered the tree then near the locality, where subsequently Hobartown was built. La Billardière gave in 1799 to this Eucalyptus the specific name E. globulus, in allusion to the button-shaped form of the fruit; but the genus Eucalyptus was founded already in 1788 on the Stringybark-tree, specimens of which were gathered in Captain Cook's last

expedition ; and it derives its name from two Greek words, alluding to the lid (Fig. II. 1), which covers the flowers before expansion. Several other species of Eucalyptus were described by Sir James Smith, before the E. globulus became known. The genus Eucalyptus comprises about 150 species, all Australian except a few from the Indian Islands and New Guinea, none extending to New Zealand and New Caledonia. Next to Acacia it is in Australia the genus richest in species. For grouping these numerous species together into systematic divisions, so as to facilitate the recognition of any of them, two methods are available. For one of these methods the nature of the bark can be adopted as affording a primary and often widely conspicuous characteristic ; for the second method of arrangement the nature of the anthers (Fig. II. 3, top) can be chosen for systematic main-distinctions. In the first case we have to place the Blue Gum-tree into the series with smooth barks, the outer cortical layers successively seceding and leaving the surface of the bark smooth ; in the second case we have to refer this species to a

Fig. I.

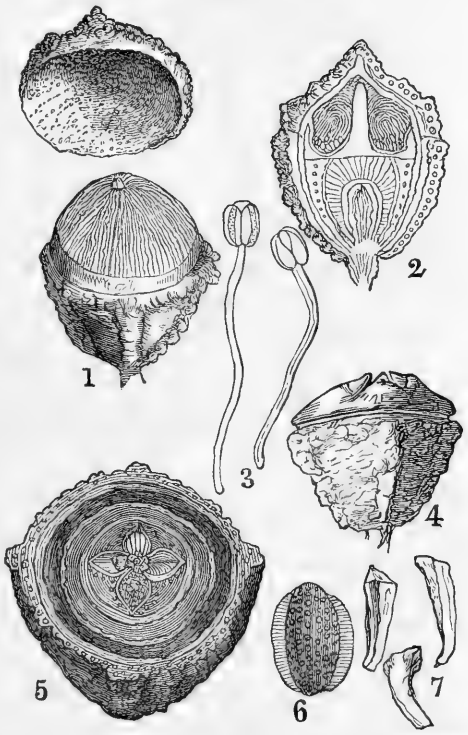


division of the genus or to a series of species, characterised by anthers developed on all stamens, consisting of two parallel cells, each opening by a longitudinal fissure.

To render the exact distinctions, by which the Blue Gum-tree can be separated from any other species, still more clear, next a botanic description of the tree will be given ; such will be easily understood by reference to the accompanying wood-cuts (Figs. I. and II.), and more readily still by comparison of any fresh flowering and fruiting branchlets.

Blue Gum-tree (*Eucalyptus globulus*).—A very tall tree, glabrous in all its parts, of great celerity in growth ; bark whitish or ashy-grey outside. Branchlets quadrangular towards the summit. Leaves of the young plant almost heart-shaped, opposite, nearly sessile, of a bluish-white hue ; leaves of the more aged plant scattered, on conspicuous stalks, of thick consistence and vertical bearing, thus one of the edges turned upwards as in most Eucalypts (not like in most other kinds of trees the full surface turned to the zenith), shining and of equal green on both sides (not like in most other sorts of trees paler beneath), several inches and occasionally almost a foot long, nearly sickle-shaped-lanceolar, entire at the edge, rather prominently but not closely veined, with a marginal (or longitudinal) vein somewhat

Fig. II.



distant from the edge, with a strong midrib and with concealed oildots. Flowers axillary, solitary or two or three together, sessile, or on a short and broad stalk; separate stalklets none. Bracteoles two, oval, pointed, $\frac{1}{3}$—$\frac{1}{2}$ inch long, half connate, clasping the flower-bud, early deciduous. Calyx (Fig. II. 1) of a bluish-white hue, dotted with oilglands; its lower portion almost obverse-pyramidal or verging into a hemispheric form; its upper portion (forming a lid or operculum) crown-shaped, both of almost equal length, warty rough, of thick consistence, an additional thin outer lid dropping early; the whole usually from $\frac{1}{2}$—$\frac{3}{4}$ inch in diameter. Petals none. Stamens (Fig. II. 3) extremely numerous, in many rows, mostly from $\frac{1}{2}$—$\frac{3}{4}$ inch long, pale yellowish, inflected before expansion; filaments capillary; anthers small, oval, yellow, fixed at the middle of the back, terminated by a gland; the two cells parallel, opening with a longitudinal slit. Style filiform, shorter than the stamens. Stigma convex, undivided, hardly broader than the style. Fruit (Figs. II. 4 and 5) often an inch broad, longitudinally angular, woody, between the depressed somewhat convex top and the calyx-tube narrowly channelled, 4–6-celled or rarely 3-celled; valves or teeth at the summit of the hollows deltashaped-triangular. Seeds (Fig. II. 6 and 7) numerous, without appendages; the greater number sterile and either narrow-clubshaped, or abbreviated and somewhat rhombeshaped; the lesser number fertile, oblique or roundish-oval, black, not shining, $\frac{1}{8}$—$\frac{1}{12}$ of an inch long. Albumen none. Embryo consisting of two broad thin cotyledons, which are folded over the cylindric radicle.

The geographic area of the Blue Gum-tree extends from the most southern districts of New South Wales through the eastern and southern counties of Victoria into Tasmania. The incertainty of the vernacular appellation will be apparent from the fact, that several very different species of Eucalyptus bear the name of "Blue Gum-trees" in many districts of New South Wales, Queensland and West Australia. The wood of ours is hard, heavy, durable, of great bearing power and of comparatively pale color. On transverse section it looks as if perforated by numerous needle-pricklings, indicative of the ducts, which are large and sometimes oblique. On longitudinal section the vascular tissue

forms dark isolated lines or pores. The individual tubes forming them are more crowded towards the periphery of the annual rings, the rest scattered or isolated; their walls are copiously dotted and their cavities partly filled with cellular substance. Short (parenchyma) cells are sparingly developed in the woody mass. The copious woody fibres are elongated, pointed towards one extremity, thickened towards the other. The medullary rays are exceedingly fine and in close proximity; they consist of one to three rows of short cells. The darker concentric lines, indicating the rings of annual growth, are easily perceptible.

Fig. III.

Fig. III.—Transverse section of aged wood of Eucalyptus globulus, magnified 300 times diametrically. The large openings represent the vascular tubes; the rows of elongated cells constitute the medullary rays; the scattered cells and those near the vascular openings are parenchyma; the woody fibres are numerous, closely set, and in diameter smaller than the parenchyma-cells.

FIG. IV.

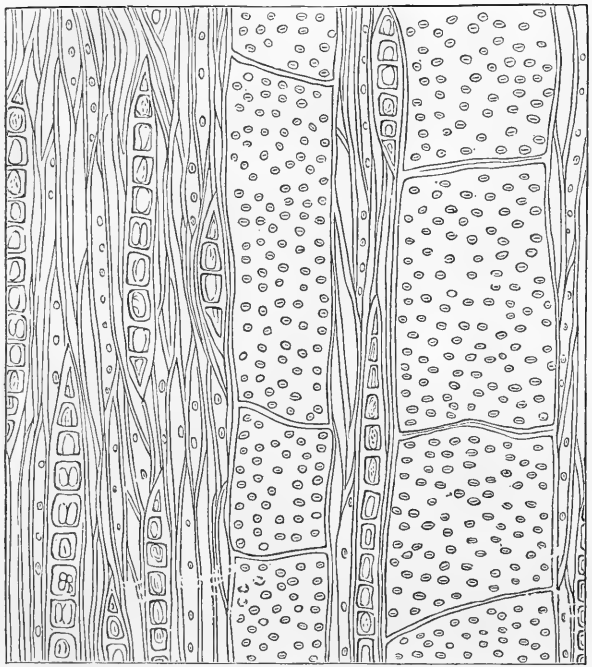


FIG. IV.—Tangential section of aged wood of Eucalyptus globulus, magnified 300 times diametrically. Broad and dotted vascular tubes; rows of cells of the medullary rays cut transversely; sparingly dotted woody fibres; parenchymatous ampler interstices.

FIG. V.

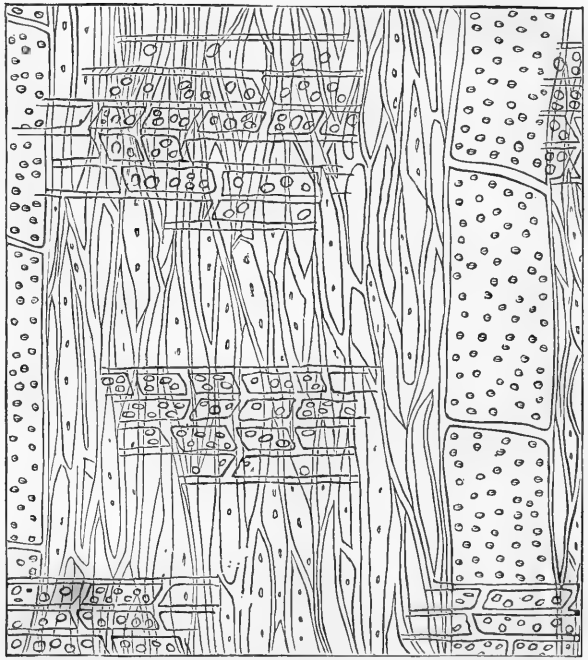


FIG. V.—Radial section of aged wood of Eucalyptus globulus, magnified 300 times diametrically. Broad dotted vascular tubes; rows of cells of the medullary rays cut vertically; sparingly dotted woody fibres; parenchymatous ampler interstices.

Fig. VI.

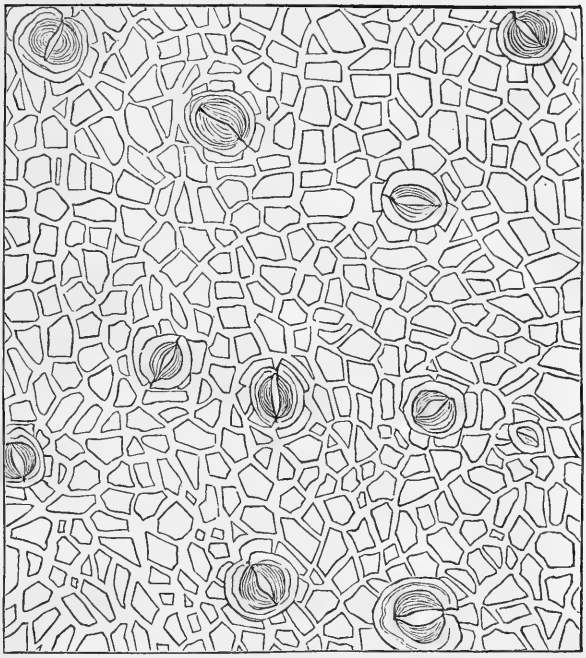


Fig. VI.—Cellular cuticle of a leaf of Eucalyptus globulus, showing also the breathing pores, magnified 300 times.

The illustration at Fig. VI. exhibits the form and arrangements of the cells and also of the trans- and respiration-pores (stomata) in the cuticle (epidermis) of the leaves of Eucalyptus globulus. About 22,000 stomata occur on a square inch of either side, whereas in most other plants the breathing pores on the lower side of a leaf vastly outnumber those of the upper side, or in numerous instances none even may occur on the upper page. Vast as the numbers of these stomata are also in Eucalypts, they are still far less numerous than those of the lower side of a Lilac- or Turnip-leaf. The particular cellular structure of the epidermis and the shape and manner of dispersion of the stomata afford marks of characteristics for many genera and even species of plants.

The Blue Gum-tree has been preferentially reared in fever-regions of various countries, in warm temperate zones, to subdue malarian influences by the exhalations of its antiseptic oil; and this volatile oil is also administered, as a disinfectant medicine, to arrest processes of putridity in various diseases. Besides it has

found extensively its way into technic (chiefly through Mr. Jos. Bosisto's exertions), to dissolve select resins and indiarubber for particular varnishes, and to dilute costly scents for the manufacture of fragrant soaps. The Eucalyptus-oil is closely allied to the cajuput-oil (from a species of Melaleuca in India), and consists of two distinct hydro-carbonous fluids. Approximately an estimate of the yield of oil from the foliage of various Eucalypts can at once be formed by merely turning a leaf towards the light, when the pellucid dots of those species, which are richest in oil, may readily be noticed even without the aid of a magnifying lens. Among the Victorian species a large yield of oil (two per cent. or even more of the fresh foliage) may be obtained from one of the White Gum-trees (namely *Eucalyptus amygdalina*), which moreover is famed as the tallest tree of the globe, surpassing when arisen from our ferntree-gullies even the renowned Californian Sequoia- and Wellingtonia-Pines in height, reaching to 400 feet and even more. Oil in proportionately large quantity is also obtained from the foliage of several dwarf *Mallee-Eucalypts*, of the inland desert-country.

The most important of all our Eucalypts for its timber is the **Red Gum-tree** (*Eucalyptus rostrata*). It lines most of the watercourses of all Australia, extending usually over the adjoining valleys. Well matured wood of this species, cut at the season when the circulation of the sap is least active, and carefully placed for gradual drying, has proved one of the most durable of any timbers of the whole globe. The quantity of tannic principle in its bark is also not inconsiderable, though much less than that of the wattles. This E. rostrata is readily obtainable in every district for the sake of comparison with E. globulus (or any other congeneric species); thus the specific characteristics can be easily contrasted, whereby a clear idea of the *meaning of species* will be gained. Both belong to the same section of the genus, whether they are arranged according to their bark or according to their anthers. The Red Gum-tree however has narrower leaves, with more numerous veins; the flowers are seated on radiating stalklets, thus forming an umbel; they are much smaller; several stalklets or pedicels are placed

on a slender stalk or peduncle; the lid of the calyx is smooth and protracted into a beak-like elongation (whence the specific name); the fruits are small and open usually with four always exserted teeth-like valves. Like in most other Eucalypts the form of the leaves of very young plants is also characteristic for this species.

To contrast further the specific characteristics of Eucalypts, a second illustration is given, that of the **Honey-Eucalypt** (*Eucalyptus melliodora*). This tree passes by the very unapt vernacular name Yellow Box-tree, though no portion of it is yellow, not even its wood, and though the latter resembles the real boxwood in no way whatever. Its systematic specific name alludes to the odor of its flowers, like that of honey, and as the blossoms exude much nectar, like most Eucalypts, sought by bees, it is proposed to call it the small-leaved Honey-Eucalypt, because the Latin name might as easily be conveyed to memory, with the advantage of its being a universal one, understood and used by all nations. Indeed the very study of the ancient languages at grammar-schools would become vain, were scientific appellations arising from Latin and Greek, mostly very euphonious, to be discarded. The bark of E. melliodora is persistent, rough and furrowed, but not very stringy; the leaves are comparatively small; the umbels consist of three or several flowers, and are partly somewhat paniculate; the calyx is rather small, not angular, with somewhat conic rarely hemispheric lid; the outer stamens are deprived of anthers, by which means this species can be easily distinguished from a very large number of its congeners; the anthers are very minute, roundish or somewhat heart-shaped, and open with two terminal pores; the fruit-calyx is half egg-shaped or truncate-ovate, narrowly margined around the summit; the teeth-like valves over the seed-bearing cavities, which vary from four to six in number, are quite enclosed within the calyx (Fig. VII.). The geographic range of the Honey-Eucalypt extends from New England to Victoria as far as the boundary of South Australia or slightly beyond it; westward thence another species, E. odorata, taking its place, seeking preferentially the limestone-formation for its growth. In contradistinction of the

Honey-Eucalypt may now also be alluded to the *Manna-Eucalypt* (*Eucalyptus viminalis*); this verges more towards E. rostrata than to E. melliodora, and is one of our most widely distributed but not often a gregarious tree. The foliage is nearly that of the Red Gum-tree, the fruit is also very similar, but the flowers stand nearly always ternately together, and have usually shorter stalklets; the lid of the calyx is not long-beaked, and the bark at the whole is somewhat persistent, while the wood is very inferior in quality as timber.

FIG. VII.

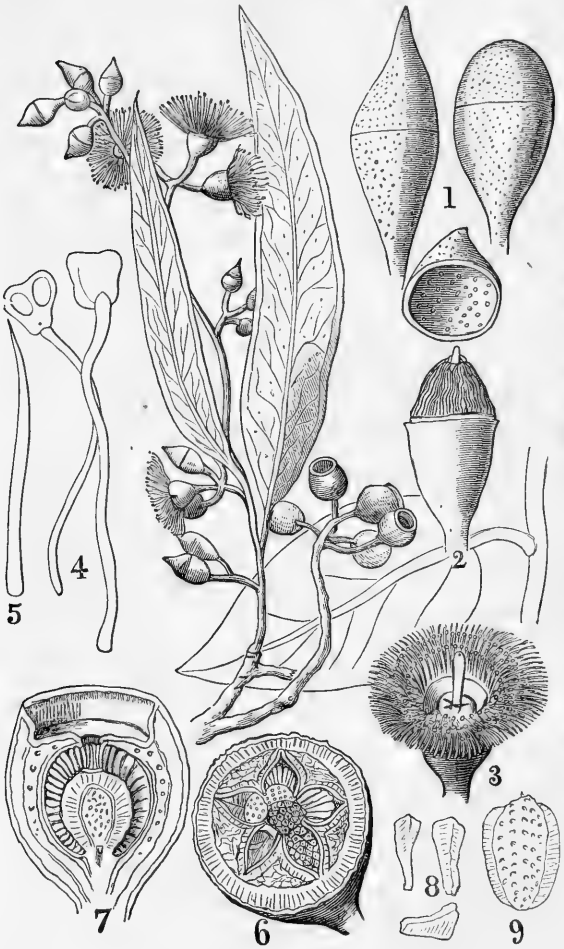


FIG. VII.—(Eucalyptus melliodora).—A leaf of a very young plant, left unshaded; 1, calyx of two varieties; 2, unexpanded flower, the lid removed; 3, expanded flower; 4, front- and back-view of fertile stamens; 5, a sterile stamen; 6, fruit seen from above; 7, longitudinal section of fruit; 8, sterile seeds; 9, a fertile seed; 1-9, variously magnified; the main-figure of natural size.

The Manna-Eucalypt extends to Tasmania, but not to Queensland and West Aus-

tralia; it is content with drier soil than the Redgum-Eucalypt. Its manna, which occurs in crumb-like pieces, is not chemically identical with the real manna used in medicine, as it contains no mannit, but forms a saccharine substance, scientifically defined as melitose, and is secreted by the instrumentality of cicadæ, which frequent this particular tree and derive nourishment from its sap. Another sugary substance, occurring on the *Mallee-Eucalypts* of our desert, called Lerp, is worthy of notice. It is the product of a psyllidous insect, and as well stated by Mr. Th. Dobson the white depressed scale-like cones are formed by the Lerp-Psylla on the mallee-leaves for its protection in the larva- and pupa-state.

The Stringybark-tree (*Eucalyptus obliqua*) constitutes a large mass of the forests of our less fertile ranges. It pertains to a division of the genus, different to that of the Blue Gum-tree and Red Gum-tree, whether its bark or its anthers are viewed. The almost stringy or fibrous bark sheds not in layers, but being persistent continues to increase in thickness and affords for the primitive buildings of the first settlers fair roofs. It can also be used for preparing potash and can be converted into pulp for the rougher kinds of paper. According to the anatomic arrangement, adopted by Dr. Josef Moeller for the Eucalyptus-Barks, that of E. obliqua belongs to the series, characterised by bast-bundles not penetrating to the whole width of the bast-rays, with few stone-cells only and with no resinous cavities in the cellular tissue (or parenchyma). The Stringybark-tree, irrespective of the nature of its bark and its very fissile wood, is in comparison to the Blue and Red Gum-trees specifically characterised by stronger fewer and less spreading veins of the leaves, by clustered calyces on very short stalklets with a hemispheric lid shorter than the tube, by almost kidney-shaped anthers and by the valves of the fruit being concealed within the cavity of the calyx.

The number of species of Eucalypts, known to occur within Victorian territory, amounts to about thirty. Many of these are restricted to defined geologic formations. Descriptions of all the species and notes on their geographic distribution are given in

the third volume of the "Flora Australiensis" by Mr. Bentham and the writer. A more popular and abridged definition of the Victorian species will be given in the second part of the School-Flora.

In the *natural system* of plants, which arranges them according to their greatest total affinity in all respects, the genus Eucalyptus finds its place in the Order of Myrtaceæ, of which the only European representative, the myrtle of the poets (Linné's Myrtus communis) became the type. Australia possesses the myrtaceous plants in vast abundance, not less than 650 species of the order being now known from our continent, and some will likely yet be added by future discoveries.

Although all agree in the leading particulars, on which the characteristics of the Myrtaceæ rest, yet the general features of these numerous plants are much diversified. So we have among them shrubs of heath-like appearance, passing as Heath-Myrtles, including among Victorian plants a few species of the genera Calycothrix, Darwinia, Thryptomene and Bæckea ; further the native tea-trees, inappropriately so called, as these bushes and trees never yield substitutes for tea, although a New Zealand species was used in Capt. Cook's early expedition, to prepare a medicinal infusion against scurvy ; these so-called tea-trees comprise within our colony species of Leptospermum, Kunzea, Melaleuca and Callistemon, the last mentioned genus producing flowers with long stamens, on which the appellation "Bottle brushes" has been bestowed. Those Myrtaceæ, which have berried fruits, abound in most intratropic regions ; we possess an only Victorian representative of this group in a noble tree of East Gippsland, the Eugenia Smithii, named by Mons. Poiret in honor of Sir James Smith, the founder of the Linnean Society. Although Middle and Northern Europe is destitute of Myrtaceæ, this is not so from mere climatic circumstances, because to the glacier-regions of the Australian Alps a few plants of this order are peculiar, growing at the verge of permanent ice, here at elevations from 6,000 to 7,000 feet over the level of the sea. On the Andes and some other lofty ranges occur also in their cold zone several myrtaceous plants.

It remains still to be pointed out in a few words by what collective notes or marks any plants of the myrtaceous order are recognised. They are all pervaded by a volatile odorous oil, have undivided leaves teethless at the margin; no conspicuous stipules; the tube of the calyx adnate to the ovary; usually four or five lobes of the calyx and frequently as many petals, which overlap each other's margin before expansion; stamens (with rare exceptions) indefinitely numerous, inserted around the summit of the calyx-tube; always two partitioned anthers; a simple style with an usually undivided stigma; axillary placentas; mostly numerous ovules; the fruit surrounded by the

Fig. VIII.

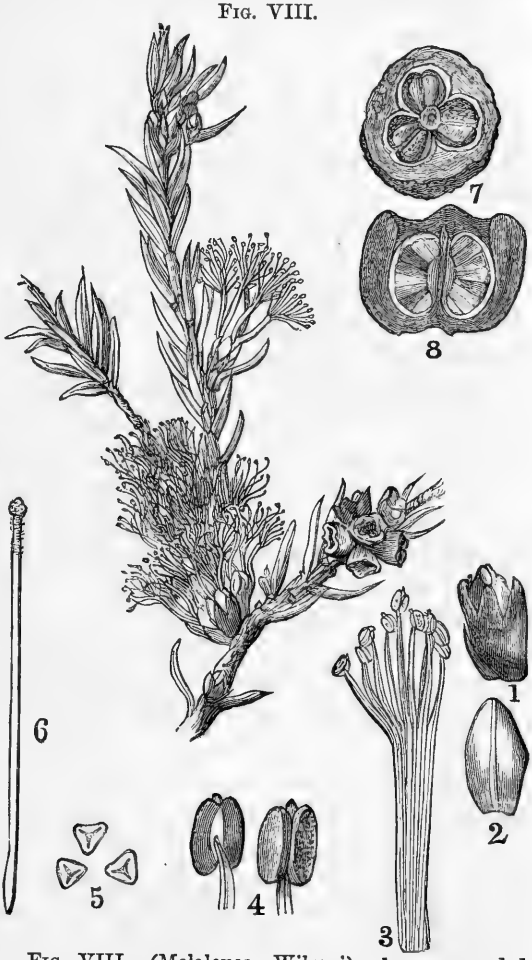


Fig. VIII.—(Melaleuca Wilsoni).—1, unexpanded flower with bract; 2, a petal; 3, a bundle of stamens; 4, front- and back-view of anthers; 5, pollen-grains; 6, style with stigma; 7, transverse section of fruit; 8, longitudinal section of fruit; all except 5 magnified several times; 5, enlarged 250 times diametrically; the main-figure of natural dimensions.

adherent calyx-tube and seeds without albumen. (See Figs. I., II., VII., VIII., IX., X.).

The definitions of three myrtaceous plants of different tribes is added, so that a fuller view of the characteristics of the order may be obtained.

Melaleuca Wilsoni (Fig. VIII.)—A tall shrub, glabrous or the young branches slightly downy. Leaves opposite, sessile, crowded, linear or narrow-lanceolar, acute, but little spreading, above slightly concave, beneath somewhat convex, $\frac{1}{3}$-$\frac{2}{3}$ of an inch long. Bracts crowded, acuminate. Flowers few, several or sometimes only one from the axis of a leaf, rarely in terminal heads or spikes; lobes of the calyx acute, half as long as the glabrous almost oval petals. Stamens pink, to about two-thirds of their length united into five bundles, long-exserted; each bundle with 9–20 filaments. Anthers fixed at their back, heartshaped-ovate. Style elongated, with a minute hemispheric stigma. Fruits almost bell-shaped, sessile, with five short teeth, placed at one side of the branchlets not around them, with three cells for the reception of the seeds; the latter small, quadrangular-conical or almost club-shaped, only partly fertile, seated on axillary placentas.

At Lake Hindmarsh, in the Tattiara country and on Spencer's Gulf. This elegant species was dedicated by the author to Messrs. Wilson of the Wimmera, under whose aid the plant was discovered.

Thryptomene Mitchelliana (Fig. IX.).—A bush, several feet in height, smooth in all parts. Leaves opposite, flat, oval or oblong, with an almost wedge-shaped base, $\frac{1}{4}$–$\frac{1}{2}$ inch long, on very short stalks. Flowers towards the summit of the branchlets axillary, solitary or two or three placed together. Flowerstalks usually shorter than the calyx; bracteoles two, opposite, very fugacious. Tube of the calyx bellshaped-oval, in age about $\frac{1}{8}$ inch long, compressed, slightly ribbed, terminated by five rounded-blunt lobes, the whole calyx about $\frac{1}{6}$ of an inch long. Petals orbicular, sessile, white or reddish, shorter than the lobe of the calyx. Stamens five, alternate with the petals, opposite to the calyx-lobes; filaments very short. Anthers red, consisting of two

almost globular cells, which open by a short slit in front; a gland at the summit of the anthers. Style very short; stigma minute. Ovary one-celled; ovules two, fixed to a narrow basal placenta. Seeds with a gradually thickened radicle, recurved at their attenuated part and terminated by two very minute cotyledons.

At the Grampians and in ranges of the vicinity, where it was found by Sir Thomas Mitchell during his discovery of these ranges in 1836.

Fig. IX.

Fig. IX.—(Thryptomene Mitchelliana.)—1, bracteole; 2, flower seen from above, showing the five large lobes of the calyx, the five small petals, five stamens, and the central style; 3, pollen-grain 250 times diametrically magnified; 4, longitudinal section of flower and young fruit; 5, transverse section of ripe fruit; the proportions of enlargement seen on comparing the drawing of the main-plant.

Eugenia Smithii (Fig. X.).—A magnificent tree, with dense dark widely spreading foliage. Leaves opposite, on short stalks, verging from a lanceolar into a rhomboid or oval or roundish

form, $1\frac{1}{2}$–4 inches long, $\frac{2}{3}$–2 inches broad, above shining and dark-green, with fine spreading veins and a marginal nerve slightly distant from the edge. Flowers in terminal ample panicles; flowerstalks opposite; stalklets often ternate. Calyx depressed at the summit, attenuated towards the base, $\frac{1}{6}$ of an inch or less long when flowering, with four very short or almost obliterated lobes. Petals four, roundish, very small, denticulated, often coherent. Stamens numerous, disconnected, exceedingly short. Anthers almost kidney-shaped, transversely slit along the summit. Style very short. Berries globular, white or purplish, one-seeded, measuring about half

Fig. X.

Fig. X. — (Eugenia Smithii). — 1, expanded flower; 2, longitudinal section of an unexpanded flower; 3, petal; 4, front- and back-view of a stamen; 5, pollen-grain; 6, transverse section of young fruit; 7, matured fruit; 8, embryo; all variously enlarged but 5, magnified 300 times; the main-figures of natural size.

an inch. Outer part of the seed (testa) thick, somewhat spongy or corky ; kernel consisting of an imperfectly divided turgid cotyledonar mass and a short radicle.

On forest-rivers of East Gippsland, thence dispersed through the moist wooded country of all Eastern Australia.

The tyro having now obtained an insight into the main-characteristics of the Myrtaceæ and having learned to recognise some of their leading forms, requires yet to trace them to the great main-division and particular subdivision of the *system of plants*, in which they hold a place. It is in the first of the three main-divisions, the *Dicotyledoneæ*, into which the order Myrtaceæ must also be inserted. Dicotyledonous plants are characterised by the following principal notes :—The stem when perennial consists of separable bark, distinct wood and central pith ; additional annual concentric layers are formed between bark and wood, the growth being therefore outward ; hence also the Greek name *Exogenæ* for dicotyledonous plants. Leaves or their stalks generally articulated at the point of insertion. Veins of leaves usually branched. Corolla very frequently present, as well as the calyx consisting prevailingly of five or four divisions. Genuine stamens, pistils and embryonate seeds always developed. Cotyledons almost constantly two and opposite or very seldom three or more in a whorl or obliterated. First rudimentary leaves from the germinating seed always opposite. This is the largest of the three main-divisions, into which plants are classified.

If we now contrast the characteristics of the second main-division, that of the *Monocotyledoneæ*, with the characters of the dicotyledonous plants, we will find : the stem when perennial without circular arrangement of bark, wood and pith, the woody fibres and vascular tubes being dispersed through the cellular tissue ; the increase of growth not distinctly in an exterior zone ; hence in contradistinction the synonym *Endogenæ* for monocotyledonous plants. Leaves or their mostly clasping stalk generally not articulated at the point of insertion. Veins of the leaves usually closely parallel. Division of the calyx prevailingly into six parts, the three inner not rarely petal-like, but no real corolla developed ; in grasses and allied plants also the calyx absent,

unless replaced by scales or bristlets. Genuine stamens, pistils and embryonate seeds always developed. Cotyledon only one. First rudimentary leaves alternate.

The third of the three great divisions of plants is formed by the *Acotyledoneæ*. These plants are devoid of real flowers, neither genuine stamens nor pistils nor embryonate seeds being developed; hence the name also of *Cryptogamæ* for the acotyledonous plants, because the sexual organs are not visible without great microscopic enlargement.

Among the Dicotyledoneæ are included all our native trees except palms and fern-trees, almost every one of our numerous shrubs, all peaflowering plants, heaths, daisylike and asterlike flowers, the everlastings, Grevilleas, Hakeas, Sundews, Misletoes, Mints, which are merely mentioned as familiar examples. Among Monocotyledoneæ we have here all lily-like plants, Orchids, Rushes, Sedges, Grasses, duckweeds, seagrasses, also our only palm; while the Acotyledoneæ comprise the ferns, mosses, lichens, fungi and seaweeds or algæ.

II.—THE WATTLES OR ACACIAS

AND ALLIED PLANTS.

The name Acacia, derived from the Greek, and indicative of a thorny plant, was already bestowed by the ancient Naturalist and Physician Dioscorides on a Gum-Arabic yielding North-African Acacia not dissimilar to some Australian species. This generic name is so familiarly known, that the appellation "Wattle" might well be dispensed with, more especially as the English word referred originally to hurdles or wickerwork, for which our Wattles are not adapted. Indeed the name Acacia is in full use in works on travels and in many popular writings for the numerous Australian species also; and inasmuch as the genus is represented likewise in Asia, Africa and America, where it is known

by its scientific appellation also vernacularly, it will be best to maintain the generic word, which has been in use since our Christian era. Few of any genera of plants contain more species than Acacia, and in Australia it is the richest of all; about 300 species, as occurring in our continent, have been clearly defined. This enormous number of congeneric plants can conveniently be separated into two main groups, according to the structure of their leaves, whether consisting of a simple blade, or whether formed by distinct leaflets. The first of this primary division is called that of the Phyllodineæ, from a Greek word implying leaf-like form, because the supposed simple leaves are in reality formed by the confluence of leaflets, stalklets and stalks into one leaflike mass, or according to the more generally adopted but less accurate views simply dilated leafstalks (phyllodia); this metamorphosis is most readily demonstrated and proved by observing the apparently simple-leaved Acacias in early growth, when the first leaves developed by the young seedling will be found to be compound, consisting of leaflets arranged in two rows, thus forming pinnæ, several again of these pinnæ forming the *bipinnate leaf*, the axes along which the leaflets are placed being also arranged in a pinnate manner. What in the phyllodineous division of the genus Acacia is noticed only on the first leaves of the young plant, becomes normal throughout for the second group, that of the Bipinnatæ.

Of each of these two divisions one or two species interests us here pre-eminently, the Black Wattle with its variety the Silver-Wattle among the Bipinnatæ; the Golden Wattle and the Blackwood-tree among the Phyllodineæ, all three being of frequent occurrence, of tall growth among their kinds and of leading technic utility.

The Black Wattle (*Acacia decurrens*).—A small or middle-sized tree, but in deep forest-glens attaining to a height of 100 feet or even more. Branchlets angular (hence the species name), usually short downy. Leaves consisting of 5–18 pairs of feather-like pinnæ, seldom less in number, at the earliest stage as well as the branchlets grey or golden-downy; leaflets linear, 16–60-paired, $\frac{1}{12}$–$\frac{1}{3}$ of an inch long, blunt, sessile; primary axis

bearing several or many glands. Racemes of flowerheads paniculate, fragrant; 20–30 very small flowers in each head; bracts narrow, with a minute dilated terminal plate; calyx bluntly 5-toothed, half or less than half as long as the corolla. Fruits strongly compressed, straight or sometimes arched, elongate- or linear-oblong, bivalved, waved or almost straight at the margin, $2\frac{1}{2}$–5 inches long, $\frac{1}{4}$–$\frac{1}{2}$ inch broad; seeds placed lengthwise, black, broad-oval, $\frac{1}{8}$–$\frac{1}{4}$ inch long, laterally faintly impressed, held by an extremely short funicle, and supported by a pale channelled and pointed appendage (aril).

Two varieties can be distinguished, usually by the colonists considered to be different species, namely, the Black Wattle (A. mollissima) and the Silver Wattle (A. dealbata), the former producing flowers in the commencement of summer, the latter early in spring, a circumstance dependent on localities, A. dealbata occupying mostly river-banks and valleys, A. mollissima more the slopes of ridges or mountains. It adscends to subalpine elevations, ceasing at about 5,000 feet, enduring considerable frost. The bark of this Wattle assumes in age a blackish color outside, which accounts for the adjective name of the species; its variety received its name from the grey hue of the young foliage.

This Acacia stands on scientific record since the end of the last century. Its geographic range stretches from the eastern districts of South Australia through Victoria and New South Wales to the southern borders of Queensland; it is besides common in Tasmania, but extends not to New Zealand, in which island not a single tall tree identical with any of Australia does occur.

The aged wood is of considerable hardness. On transverse section the concentric zones, the vascular pores and medullary rays become readily visible. The vascular tubes stand often in pairs or longitudinal groups; under a compound microscope these exhibit transparent or pale walls, which are very finely dotted and filled with yellowish resinous substance. Parenchyma (tissue of short and blunt cells) is scanty and surrounds mainly the vascular ducts. The very fine medullary rays consist each of

one, two or three rows of compressed thin-walled cells. The woody fibres are very long, finely pointed, comparatively thick-walled, and very scantily dotted; in cross-section they show

Fig. XI.

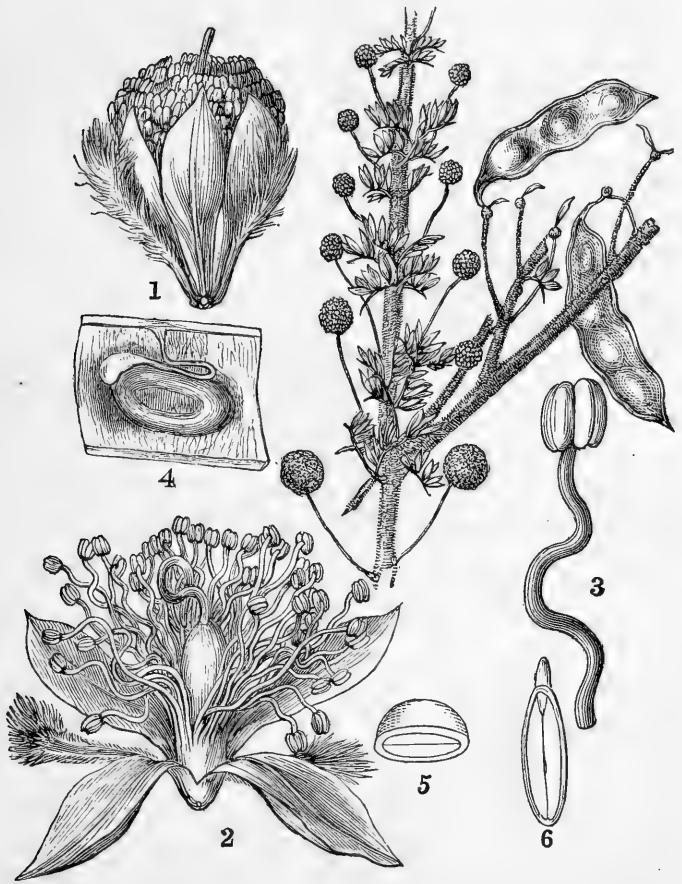


Fig. XI.—(Acacia Mitchelli).—1, a separate flower before full expansion; 2, a separate flower fully expanded, showing the bearded divisions of the calyx (sepals), the lanceolar petals, the numerous filaments with roundish anthers, and the central ovary terminated by the twisted style; 3, stamen; 4, portion of the fruit (legumen) laid open, exhibiting a seed with its thick aril and slender funicle; 5, transverse and 6, longitudinal section of a seed, showing the two cotyledons; all analytic details variously magnified.

themselves roundish, with walls as thick as the hollow centre. (This is in consonance with observations instituted by Dr. Josef Möller.)

The Wattle-bark of this species is twice or thrice as rich as Oak-bark in tannin. The tree exudes a considerable quantity of gum, which resembles gum Arabic and is of similar use.

We have in Victoria only two more pinnate-leaved Acacias, namely A. discolor of Gippsland and Acacia Mitchelli of the Ovens-Ranges, Grampians and Glenelg-River. But, on the contrary, we are acquainted with about fifty phyllodinous Victorian Acacias, mostly of shrubby growth only. The description of two of the most important arboreous species will suffice, to initiate the tyro into the mode of noticing the principal characteristics of these kinds of plants.

The Golden Wattle (*Acacia pycnantha*).—A small tree, flowering often already as a shrub, glabrous in all parts, branchlets often reddish-brown, not conspicuously angular. Phyllodia (leaves) oblong or lanceolar, sickle-shaped, occasionally oblique-ovate, one-nerved, 2½–6 inches long, 1–1½ inch broad; with spreading veins and with a marginal gland above the base. Flowerheads in racemes, fragrant; floral bracts consisting of a minute roundish plate, attached centrally to a slender stalklet. Calyx short-lobed or almost truncate, more than half as long as the connate petals (corolla), velvet-downy at the margin. Fruits broad or elongate, linear, flat, straight at the margin or but slightly waved. Seeds black, oval, placed lengthwise, on a short funicle, which is thickened into a pale boat-shaped semicylindrical mass (aril) of about half the length of the seed.

This is one of the most beautiful species, when seen loaded with its bright-yellow flowers early in spring; it is furthermore one of the most useful among its congeners, being like the Black Wattle rapid in growth, yielding a bark very rich in tannin, and also a copious supply of gum. Its geographic limits extend from South Australia through Victoria to those districts of New South Wales, which border the Murray-country; not existing naturally in Tasmania. As it will live in mere coast-sand, this species becomes also important for staying and utilizing sandy

drifts at sea-shores. The species-name from the Greek refers to the very numerous flowers closely placed in each head.

The Blackwood-tree (*Acacia melanoxylon*).—A shady middle-sized or in forest valleys a large tree. Phyllods oblong- or narrow-lanceolate, 2–5 inches long, $\frac{1}{3}$–1 inch broad, with several longitudinal nerves, closely net-veined, with a gland at the base. Flower-heads in short racemes, seldom two or solitary, light-yellow. Calyx almost truncate, half or more than half as long as the corolla. Fruits arched or twisted, 2–4$\frac{1}{2}$ inches long, $\frac{1}{4}$–$\frac{1}{3}$ inch broad. Seeds ellipsoid, placed lengthwise, doubly surrounded by the scarlet funicle.

One of the most important of all trees of Australia, scattered along river banks and over fertile valleys of our colonial territory, extending widely to

Fig. XII.

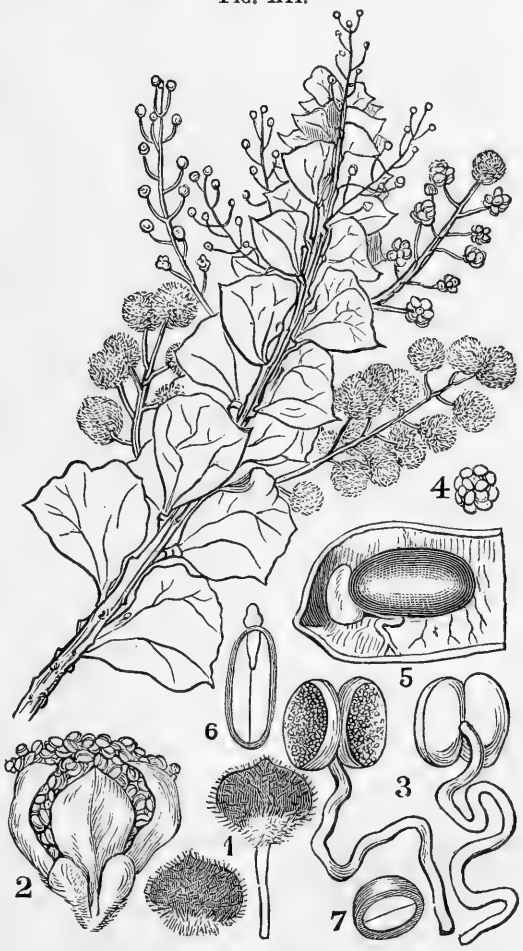


Fig. XII.—(Acacia pravissima).—1, bracts; 2, a single flower separated; 3, stamens; 4, pollen-grain; 5, portion of fruit, opened; 6, longitudinal section of seed; all except 4 more or less magnified; 4, diametrially 300 times enlarged.

South Australia, Tasmania and New South Wales. The wood is most valuable for furniture, carriages, casks, planks and other technic purposes ; it is of unusual hardness. The vascular pores are isolated in pairs, or often in little groups ; the anatomic structure at the whole is not dissimilar to that of Acacia decurrens, but the woody fibres are pressed more closely together.

A single illustration of the numerous shrubby species of Acacia must on this occasion suffice, to initiate into their study ; the representative species chosen for the purpose being *Acacia pravissima*, a rare one, confined to the eastern regions of this colony (Fig. XII.).

To complete a first insight into the large order of *Leguminosæ*, to which the Acacias belong, it is deemed advisable to cite representatives of the two other tribes of this Order, the Acaciæ being referable to the *tribe of Mimoseæ*, distinguished by small symmetric flowers, with petals usually towards the base united into a tube, and as well as the lobes of the calyx contiguous (not overlapping) at the margin while in bud. In the *tribe of Cæsalpineæ* the petals are free, unequal or hardly equal, and with their margins overlapping before expansion, the upper petal being the innermost. In the *tribe of Papilionaceæ* the petals are very unequal, the upper one being the broadest and outermost, the two lower petals connate, all overlapping at their margin while in bud.

Cassia artemisioides (Fig. XIII.)—Shrubby, pale velvet-downy or somewhat silky or almost glabrous. Leaves consisting of one to six pairs of leaflets or of a dilated leafstalk (petiole) without leaflets. Stipules very narrow, acute, deciduous. Axis (rachis) of the leaves (when leaflets are developed) simple, channelled- or compressed-filiform or flat ; leaflets of equal color on both sides, $\frac{1}{4}$–2 inches long, in one pair or pinnately arranged in several pairs, semicylindric or flat and then from linear to oval, entire ; a depressed gland sessile between the leaflets of the lower or several pairs of them, seldom obliterated. Flowers fragrant, several or few in a corymb or rarely only two or one on the stalk, each provided with a slender stalklet. Bracts small, oval, early dropping. Sepals (free segments of the calyx) unequal in size,

oval or some roundish, partly petal-like colored and membranous. Petals yellow, roundish-oval, $\frac{1}{3}$–$\frac{2}{3}$ of an inch long, somewhat unequal, narrowed into a short stalk-like base. Stamens ten, disconnected, all fertile; filaments short; anthers brown or yellowish, linear-cylindrical, blunt, with a bilobed base, each of their two cells opening by a terminal pore, which gradually lengthens into a short slit; two or three of the lower anthers somewhat larger and on longer filaments. Pollen-grains (when examined under a compound microscope) oval, smooth, fissured lengthwise. Ovary more or less arched.

Fig. XIII.

Fig. XIII.—(Cassia artemisioides, var. eremophila and lower down var. phyllodinea).—1, sepals and petals, natural size; 2, an upper stamen; 3, a lower stamen; 4, a pollen-grain, magnified 250 times; 5, pistil; 6, seed, with funicle; 7, transverse section of a seed, showing the cotyledons surrounded by albumen; 8, cotyledon and radicle; 2, 3, 5, 6, 7 and 8 magnified several times.

Style very short. Stigma depressed. Fruit flat, narrow-oblong; its two sides of thin consistence, separating from each other longitudinally (bivalved), without complete internal divisions (septa). Seeds on short funicles placed transversely, almost oval, compressed, strongly contracted at the base, dark-brown, shining, turning with their sides (not their edges) to the walls of the fruit, marked on each side with a linear-oblong impression. Albumen more spacious than the straight embryo and of hard consistence. Cotyledons stretching through nearly the whole length and width of the seeds, flat, roundish-oval, twice or three times as long as the conical radicle.

In the north-western desert-country of our colony, thence widely distributed through most of the lowland-scrubs of the arid regions of the Australian continent.

The wood-engraving illustrates only the narrow-leaved and the leafless form of this protean plant. The species is particularly interesting, as demonstrating the extreme *variability*, to which some plants are subject. Only one other Cassia occurs in our colony as the sole representative of the Cæsalpineæ. The tribe however of the Papilionaceæ, so called from some fancied resemblance of the flowers of these kinds of plants to a butterfly, or the pea-flowering tribe, is largely represented in Victoria, and indeed in nearly every other part of the globe, both in the hot and cold zone, though extremely rare in New Zealand, where Mimoseæ and Cæsalpineæ are totally absent. For brevity's sake only the following plant of this tribe is adduced in these pages, but our brilliant flowered Kennedyas, the well known Indigofera, the widely dispersed Pultenæas and Dillwynias (which latter are always simple-leaved) are familiar samples of this tribe, full information about which may be sought in the second volume of the Flora Australiensis.

Glycyrrhiza psoraloides, or the native Liquorice (Fig. XIV.). —A procumbent or adscendent perennial herb, somewhat woody at the base, more or less glandular-viscid. Leaves simply pinnate, consisting of 7–11 leaflets. Stipules triangular-lanceolate. Leaflets, except the terminal one, in pairs, lanceolar, rarely linear, or those of the lower leaves oval, $\frac{1}{2}$–1 inch long. Flowers

in conspicuously stalked dense spikes. Bracts linear, channelled, pointed, deciduous. Calyx $\frac{1}{6}$–$\frac{1}{8}$ of an inch long, with five acute lobes, the two upper of which by their union shorter. Petals lilac or white. Upper petal oval-lanceolar, almost sessile, longer than the rest; lower petals slightly coherent, with a supra-basal lobe, as long as the lateral petals, and as well as these narrowed into a stalk-like base. Stamens ten; the upper one separated and disconnected; the nine others connected to near the middle by a tender membrane. Anthers oval-heartshaped, bursting so as to almost form two valves from their summit. Pollen-grains

Fig. XIV.

Fig. XIV.—(Glycyrrhiza psoraloides).—The main-figure of natural size; 1, a separate flower with a bract below; 2, upper petal; 3, a lateral petal; 4, a lower petal; 5, stamens and pistil; 6, a pollen-grain; 7, a fruit; 8, section of fruit; 9, seed; 10, embryo (cotyledons and radicle); the main-figure of natural dimensions; 6, magnified 300 times.

roundish, opening with three pores. Ovary sessile, with two ovules. Style slender. Stigma hemispheric. Fruit oval or roundish, $\frac{1}{6}$–$\frac{1}{4}$ of an inch long, densely beset by minute and partly hooked prickles and asperities, indehiscent, beaked by the style. Seeds ripening one or two, without any appendage. Embryo surrounded by albumen. Cotyledons oval, plane-convex; radicle divergent, almost cylindrical.

On the Murray-River and its lower tributaries.

III.—THE CASUARINAS OR SHEOAKS.

The scientific name of these well-known plants is as appropriate as their vernacular appellation is odd and unsuited. The former alludes to the Cassowary (Casuarius), the plumage of which is comparatively as much reduced among birds, as the foliage of the Casuarinas is stringy among trees. Hence more than two centuries ago Rumph already bestowed the name Casuarina on a Java-species, led by the Dutch colonists, who call it there the Casuaris-Boom. The Australian vernacular name seems to have arisen from some fancied resemblance of the wood of some Casuarinas to that of Oaks, notwithstanding the extreme difference of the foliage and fruit; unless, as Dr. Hooker supposes, the popular name of these trees and shrubs arose from the Canadian "Sheack." Here in Victoria only a few species concern us, although representatives of the genus are dispersed from East-Africa to South-Asia, Polynesia and Tasmania. The main-characters of the genus, which is as far as hitherto known the only one of its order (Casuarineæ), are as follows: Staminate flowers in spikes, with one or two sepals; pistillate flowers in tufts, without any calyx. Stamen solitary; anthers consisting of two partitions, slit along the margin. Ovary one-celled, with two ovules. Stigmas two, threadlike, acute. Fruit (somewhat resembling a pine-cone)

formed of a woody axis and hardened connate bracts and bracteoles, each pair of the latter enclosing a seedlike compressed fruitlet, which is elongated into a long membrane at the summit, the style forming a line through this membranous appendage. Seed solitary, compressed, surrounded by coiled or curled fibres or tubes (spiral vessels) between their outer adnate and their inner integument. Albumen none. Cotyledons oval, plan-convex, the short radicle lodged at their apex. The leaves of all Casuarinas are reduced to minute whorled teeth or bristles, arising from a cylindric joint. The transit of such diminutive or rudimentary leaves to those of more developed form can be traced in the somewhat allied order of Coniferæ from Cypresses to Pines; in reality the cylinders around the joints of the branchlets of Casuarinas must be regarded as formed by the concrescence of leaves, each teeth being merely the apex of a leaf. The wood shows the annual layers and the medullary rays very distinctly and contains also many spiral vessels. Many of the cells are filled with starch, as easily may be observed by treating the microscopic preparation with iodine. The order of Casuarineæ belongs to that series of Dicotyledoneæ, called on account of the absence of a corolla or of petals *Monochlamydeæ or Apetalæ*, there being in such only one floral envelope. But Casuarinæ are by their floral organization widely removed from Coniferæ, and brought into closer affinity with Birches and Beeches, only the latter of which being represented in our colony and that by a solitary noble species, Fagus Cunninghami, our *evergreen Beech*, a native of some of the cooler forest-regions from Gippsland to Cape Otway, where it passes under the strangely inappropriate name Myrtle.

Among the three tall-growing Casuarinas of our colony the one with erect dark-green foliage, the *erect Casuarina* (C. suberosa) is chosen for illustrative delineation (Figs. XIV. and XV.). Its whorls consist of 6 to 8 leaves; the staminate spikes are slender; the stigmas are red; the lignescent bracteoles are in fruit protruding, only slightly acute and transversely thickened. This is a common species with us; it extends to Tasmania, New South Wales and Queensland.

Fig. XV.

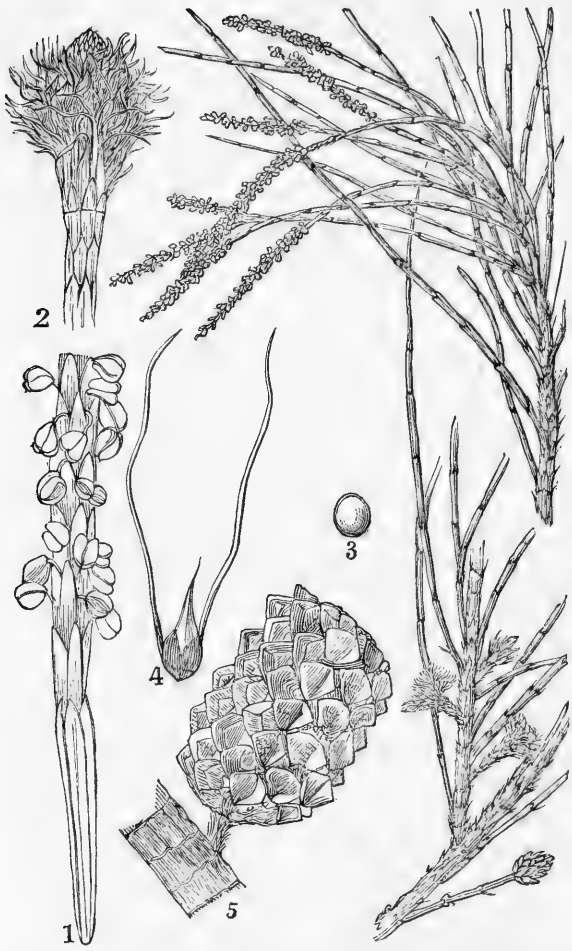


Fig. XV.—(Casuarina suberosa).—1, staminate flowers; 2, pistillate flowers; 3, pollen-grain; 4, stigmas and bract; 5, fruit; 3, magnified 300 times diametrically.

Alike frequent is the *Pendent Casuarina* (Casuarina quadrivalvis), the species with coarser mostly pendulous foliage of less vivid green, with 9 to 12 leaves united around each usually elongated joint, each terminated into an acute point, with long staminate spikes and much exserted seed-bearing bracteoles. This species does not extend to Queensland, but advances into South Australia. It is a tree not without importance, as it will live in sterile soil, even helps to bind drift-sands of the coast, is of celerity of growth and yields superior fuel. Pastoral animals browse on the foliage, which is acidulous from a crystallisable substance allied to bicitrate of lime. The *grey Casuarina* (Casuarina glauca) is a tall species, confined in our territory to

the desert-tracts, but nevertheless ranging from the east-coast to the west-coast of extra-tropic Australia. The branches are not pendent, the joints of the foliage but very slightly streaked and terminating into 8–16 appressed teeth. The whorls of the staminate spikes are closely approximate to each other, the fruits are short and the seed-like fruitlets are pale, not dark-brown as in most congeners. Our common *shrubby Casuarina* (C. distyla) is of wide dispersion through the more southern part of the Australian continent. The bracteoles, which form a large outer mass of the fruit, are blunt, turgid and comparatively short. The rudimentary leaves of each cylinder are varying from six to eight.

FIG. XVI.

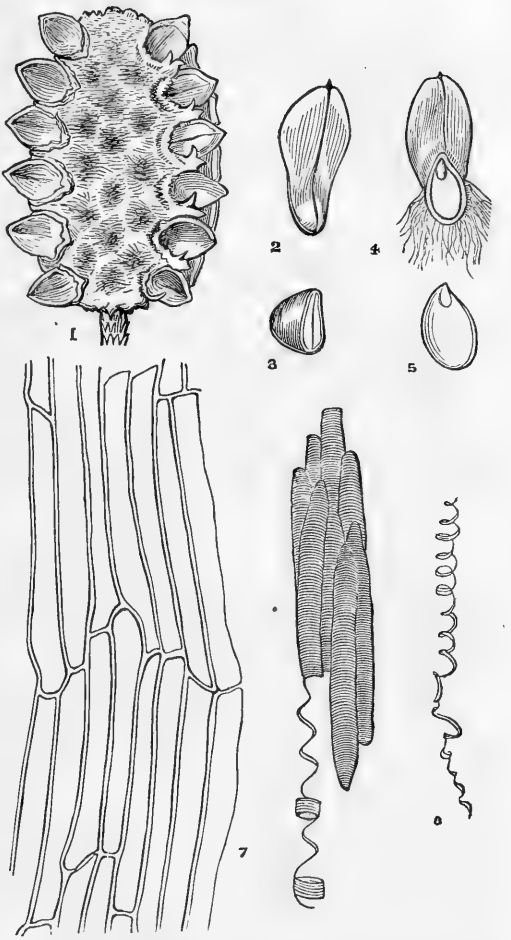


FIG. XVI.—(Casuarina suberosa).—1, longitudinal section of fruit; 2, seedlike fruitlet; 3, fruitlet opened longitudinally; 4, transverse section of seed; 5, embryo; 6, spiral vessels, partly uncoiled, from the stratum between the seed and fruit-shell; 7, vascular tissue of the walls of the fruit-shell (pericarp); 6 and 7, magnified 300 times diametrically.

IV.—THE CYPRESS-PINES OR SANDARAC-TREES.

The coniferous trees (Coniferæ) of our colonial territory are limited to four, three of which pertaining to the genus Callitris or Frenela, the fourth belonging to Nageia or Podocarpus. This paucity of trees of the Pine-order is all the more remarkable, as elsewhere in sub-alpine regions, such as we possess, Coniferæ are well represented ; so it is also in Tasmania and New Zealand, but our own Alps produce only a dwarf and often prostrate conifer of the Yew-tribe, the Nageia montana. More accessible and more conspicuous are our Frenelas, which are members of the Cypress-tribe and differ merely, so far as generic characters are concerned, from the Callitris quadrivalvis or true Sandarac-Cypress of the countries at the Mediterranean Sea in having a fruit-whorl of six not four lobes. The resinous exudation, well known as Sandarac and much used for varnishes, is almost identical in all these trees. The most common of our Frenelas is that, which occurs in the desert-tracts of the colony, Frenela or Callitris verrucosa, far known by the name Murray-Pine, though not belonging to the fir-tribe of the order. It has the habit of a tall cypress, in which respect it not differs from the many other Frenelas, which occur in various parts of Australia. The minute scale-like leaves, decurrent along the joints of the branchlets, are also in all species (but one with quaternary leaves) ternate, and they remind of similar structures of the foliage of Casuarinas and Exocarps. From the two other Victorian Frenelas the desert-species is separated by its not distinctly angular ultimate branchlets, not usually clustered but mostly solitary fruits, which moreover are neither angular nor much furrowed before expansion ; the lobes of the fruit are not partly dilated upwards, nor much pointed towards the summit of the back, but often warty outside ; from the last-mentioned note the species obtained its systematic name. The two other congeners, indigenous to our colony, namely F. rhomboidea and F. Endlicheri, are not of frequent occurrence and are inhabitants of mountains or coasts. Frenela advances beyond Australia only

to New Caledonia. The variability of the cotyledons, two or three, in this genus is very remarkable.

Coniferæ are among Dicotyledoneæ the lowest in development, so far as floral organization is concerned. The anther-cells are simply inserted on a scale, nor are the singular stamens surrounded by any calyx. Neither have the pistils of the always unisexual flowers any calycine envelope, while also style and stigma are not fully developed as in any other orders of Dicotyledoneæ as well as Monocotyledoneæ, except the allied but palm-leaved Cycadeæ. The name of the order was derived from the conical shape of the fruits of many true Pines.

Fig. XVII.

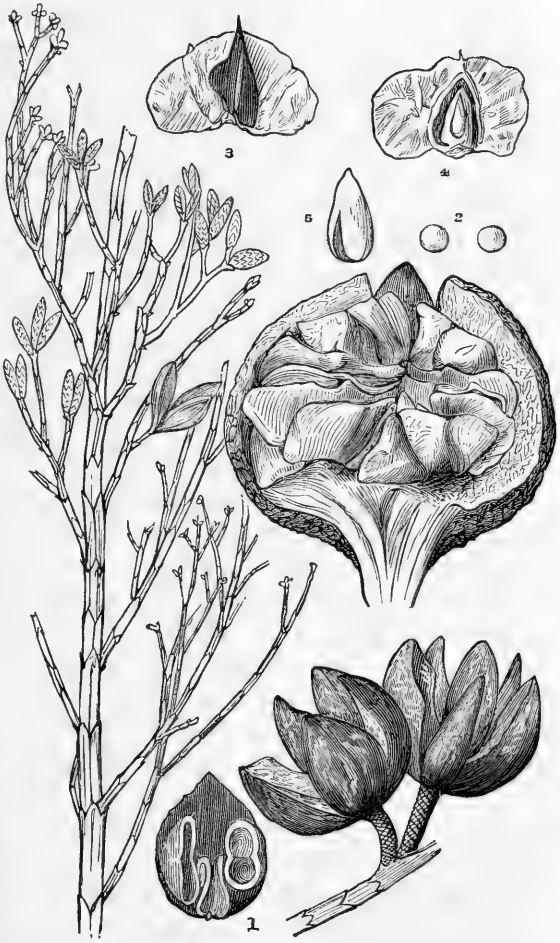


Fig. XVII.—(Frenela verrucosa).—1, scale with anthers much enlarged; 2, pollen-grains magnified three hundred times diametrically; 3, fruitlets; 4, longitudinal section of fruitlet; 5, embryo; unnumbered, a longitudinal section of a fruit.

V.—THE EXOCARPOS-TREES OR NATIVE CHERRY-TREES

AND ALLIED PLANTS.

Also the principal of these kinds of trees received its generic name first from the French naturalist La Billardière, during D'Entrecasteaux's Expedition. It was our common Exocarpos cupressiformis, which he described, and which has been mentioned so often in popular works as a cherry-tree, bearing its stone outside of the pulp. That this crude notion of the structure of the fruit is erroneous, must be apparent on thoughtful contemplation, for it is evident at the first glance, that the red edible part of our ordinary Exocarpos constitutes merely an enlarged and succulent fruit-stalklet (pedicel), and that the hard dry and greenish portion, strangely compared to a cherry-stone, forms the real fruit, containing the seed. Nevertheless La Billardière availed himself of the vernacular name, by which the Exocarpos attained early and almost miraculous fame, for finding a generic appellation for it, the Greek word indicating a position of the seed outside of the fruit. The *cypress-like Exocarpos*, as the tree ought to be called rationally, is of wide dispersion through our colony except the desert, where it is replaced by another species. The tree ranges from South Australia to Queensland and extends also to Tasmania. It is never tall. Its leaves are reduced to minute scales, but alternate and are never arranged in whorls like those of our Casuarinas and Sandarac-Pines, although the habitual resemblance of all these trees is great. The flowers are exceedingly small, mostly bisexual, consist of five segments, and are arranged in short spikes or small clusters, one only as a general rule advancing into fruit on each little inflorescence. The five anthers are seated on very short but comparatively broad filaments, and are placed opposite (not alternate) to the segments of the flower; the cells of the anthers are divergent and open longitudinally. The stigma is sessile and bilobed. The fruit, raised on the brilliant-red stalklet, contains one erect seed; the latter

consists for the greater part of copious albuminous substance ; the minute embryo occupies the uppermost part of the kernel, and is divided at the lower end into two cotyledonar lobes. This tree occurs nowhere gregariously, but is scattered among other trees, and prefers an individual close approach to their shelter or shade. For artistic illustration of the Exocarps is here chosen E. spartea, the desert-species, remarkable for its pendent slender branches ; the leaves of this tree are longer and drop early, and exceptionally dilate also ; the flower-spikes are also more elongated ; the division of the flowers varies into four or five segments and the corresponding numbers of stamens ; the fruitstalks are less turgid and also less intensely red.

Fig. XVIII.

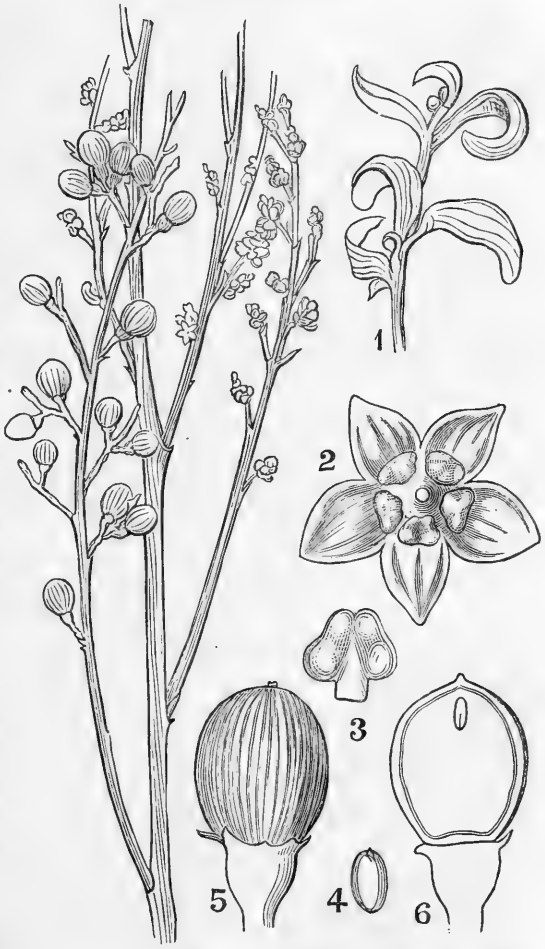


Fig. XVIII.—(Exocarpus spartea).—1, an exceptionally broad-leaved branchlet ; 2, flower seen from above ; 3, stamen ; 4, pollen-grain ; 5, fruit ; 6, the same longitudinally dissected, to exhibit albumen and embryo.

We possess in

Victoria besides another desert-species, E. aphylla, which is of shrubby growth, produces stout often spinescent branchlets, has sessile very short clusters of flowers and extremely short scale-like leaves. Particularly along watercourses occurs another shrubby congener, E. stricta ; the branchlets of this are very angular ; the flowers are prevailingly cleft into four parts and the succulent stalklet of the fruit is pale. Our only other Exocarpos, namely E. humifusa, is restricted to alpine elevations, forming there a prostrate bush, sometimes reduced on the coldest places near the edges of glaciers to almost herbaceous growth. These plants belong to the order of *Santalaceæ*, of which the Sandal-wood trees, species of Santalum, are the typical representatives. The so-called *native Peachtree* of our desert tracts is a true Santalum, S. acuminatum, and to this is associated another species, Santalum persicarium, which however does not afford any pulpy acidulous fruit, although the kernels of both species are edible.

Passing the other Victorian plants of the santalaceous order (species of Thesium, Choretrum and Leptomeria, none arboreous) it remains to be observed, that the impossibility of depending on solitary characteristics even for main-classification is strikingly demonstrated by the Santalaceæ. For they afford an instance of the occurrence of fruits placed above the calyx (in Exocarpos) and fruits enclosed within the tube of the calyx (in Santalum), therefore technically called *superior and inferior fruits*, within the limits of the same order. Another remarkable feature of Santalaceæ is their tendency to parasitic (or epiphytal) growth ; thus the species of Thesium, of which we have only one in Australia (T. Australe), are fond to grow on the roots of other plants, and this accounts for the difficulty experienced in the cultivation of many of the Santalaceæ ; by these means also an approach to the order of Loranthaceæ, irrespective of other mutual affinities, is established.

The word Santalum is of Arabic origin. Leptomeria got its name from the minuteness of the floral segments. The fruit of our principal species, Leptomeria aphylla, is succulent, pleasantly acidulous and harmless.

VI.—THE MISTLETOES
AND ALLIED PLANTS.

Records of the Mistletoes are extant from the remotest antiquity, the Oak-Mistletoe being of sacred renown since the time of the Druids, and it was in medicinal use also already by Dioscorides and Theophrastos. The English Mistletoe is the well-known Viscum album, whereas all the Victorian kinds belong to the genus Loranthus, of which the Mediterranean L. Europæus is the prototype. The generic name arose in allusion to the (straplike) narrowness of the petals. All species of the genus Loranthus are parasites and adhere to the branches of trees, on the sap of which largely their subsistence depends. If therefore the nutritive fluid of the infested branch becomes exhausted, it dies and with it the invader. Birds are much instrumental in carrying the seeds of Mistletoes from tree to tree, the sticky pulp of the berries, which furnishes birdslime, facilitating the adherence of the seed to the bark of the branch or stem, on which they vegetate. Remarkable are many instances of mimicry shown by our Mistletoes; thus the leaves of some resemble so much those of certain Eucalypts as to render the difference of the foliage not readily apparent from the distance, while the leaves of some Mistletoes on Casuarinas assume a stringlike form. Strange is also the discrepancy of the foliage of some Loranths, when growing on very different plants; therefore the Mistletoes afford also excellent examples for the study of *variability of species*. The one chosen for illustration is *Loranthus celastroides* (Fig. XIX.), one of the most frequent of ours, and one of the most variable. When growing on Eucalypts it is narrow-leaved, when preying on Native Honeysuckles (Banksias) the leaves assume a broad form; it lives also on Casuarinas and several other kinds of trees, and readily becomes a troublesome intruder of gardens. The leaves stand always opposite, and alter in form from narrow-lanceolar to oval, seldom however on the same individual plant; they, like those of all other Mistletoes, are

of thick-consistence and at the margin entire. The flowers are ternately placed on the ultimate stalks, several of these forming a panicle. The margin of the calyx is slightly waved and thus teethless as in most Loranths (conspicuously dentated calyces occurring in few species). Petals 5 or sometimes 6, yellowish - red, measuring $1\frac{1}{3}$ to 2 inches in length, narrow, seceding in age, glabrous like all other parts of the plant. Stamens opposite to the petals and more than half of their length adnate to them; free part of filaments finely awlshaped (subulate). Anthers fixed at their back, in an almost transversal

Fig. XIX.

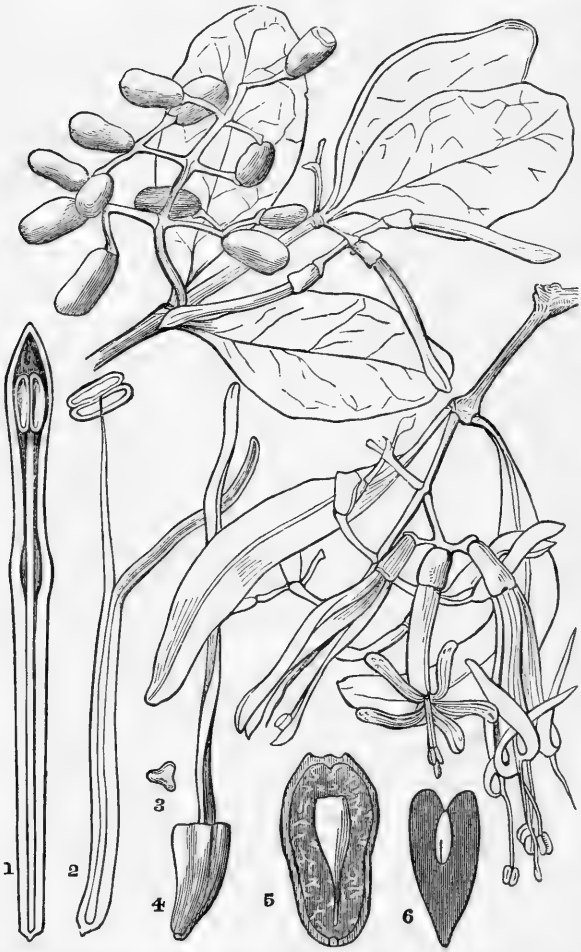


Fig. XIX.—(Loranthus celastroides).—1, a petal from an unexpanded flower; 2, the same from an expanded flower; 3, pollen-grain; 4, berry with style; 5, longitudinal section of berry; 6, longitudinal section of seed.

position at the summit of the filament, oval, bursting with two longitudinal slits. Style threadlike, about as long as the petals. Stigma slightly dilated. Fruit totally enclosed in the tube of the calyx, one-seeded, viscid inside, oval or somewhat pear-shaped. Seed erect; its albumen large; the short embryo near its summit; the cotyledonar portion turned downward; the radicle narrow-conical. This species extends to New South Wales and Queensland, but not to Tasmania, where no Mistletoe exists.

Another common Victorian species is the Loranthus pendulus; it is not unlike L. celastroides, being pendent in long masses from the branches of Eucalypts chiefly; it is also variable in the form of its foliage, but the leaves are here usually elongated and narrow and the anthers are erect and fixed at the base, while L. celastroides is the only one in our colony, which has the anthers fixed dorsally. A variety occurs, which is all over grey and slightly downy. This species ranges over the whole Australian continent.

The two remaining Victorian Loranths are truly ornamental objects, most decorative to the trees, which they infest, though destructive to them. The Loranthus Exocarpi prefers the Casuarinas and as the name implies also the native Cherry-trees to settle on, but it occurs also on Melaleucas, Acacias, Myoporums, less commonly on Eucalypts or introduced trees, and sometimes it preys on other Loranths, effecting a double parasitism. Its leaves are linear or oblong or somewhat wedge-shaped; the flowers stand axillary in a single pair or solitary; the petals are brilliantly red or yellow and tipped with green, and do not readily separate towards their base; the berries are black. Loranthus linophyllus is easily recognised among all others of this colony by its stringlike leaves, which never become flat, while the flowers approach those of L. pendulus, being red inside; the berries are pink and very succulent. It is found in nearly every part of Australia, and inhabits preferentially Acacias with us, particularly Blackwood-trees.

Birdslime is obtainable from the viscous berries of the Mistletoes.

VII.—THE NATIVE HONEYSUCKLES OR BANKSIAS

AND ALLIED PLANTS.

The order or family of plants to which the Banksias belong, derives its name Proteaceæ from a South African genus, Linné's Protea, and this again was called so, because some species were thought to be as mutable in their appearance as the mythic Proteus of the Greek legends. Discoveries in Australia, where this order is more extensively developed than even in extra-tropic Africa, have fully justified the name of the order, for although hardly any herbaceous plants occur among the several hundred Proteaceæ, now known, yet these bushes and trees exhibit in foliage as well as disposition and form of flowers such great diversity, as hardly is to be found within the limits of any other order of the whole vegetable empire. The plants of the genus Banksia are leadingly drawn forward on this occasion as examples for instruction, because they are among the largest and most stately of proteaceous plants, and are in our colony, like in many other parts of Australia, well known by the rather inappropriate name Honeysuckles, none having resemblance to British Honeysuckles, although from their flowers secrets a sweetish liquid also, sought by bees. Thus also the magnificent Protea mellifera of our gardens is called the Cape-Honeysuckle, on account of the melliginous nectar contained in their great flowercups.

The Banksias are of historic interest, inasmuch as the genus was dedicated already by the younger Linné in 1781 to Sir Joseph Banks, from whom the Swedish naturalist received branchlets of those species, which in Captain Cook's first voyage more than 100 years ago (1770) were gathered by Banks at Botany-Bay and a few other places of the east-coast of Australia. These were the first plants, peculiar to Australia, which became known descriptively, except some brought by Dampier from the north-west coast in 1688 and 1699, and figured in his and Dr. Plukenet's works.

Our *Seacoast-Honeysuckle* (Banksia integrifolia), which advances westward to Port Phillip, and the *Sawleaved-Honeysuckle* (Banksia serrata) of Gippsland are two of the four species described by the son of Linné, whereas our commonest plant of the genus was subsequently defined by the Abbé Cavanilles of Madrid.

The common Honeysuckle, (Banksia marginata), is a middle-sized or oftener a small tree, retaining on poor heath-ground shrubby dwarfness. The leaves are variable from broadly linear to narrowly wedge-shaped, scattered or crowded and sharply indented unless oftener quite entire, but frequently recurved at the margin, blunt or retuse at the summit, almost white beneath, with very subtle and closely netted veins; length

Fig XX.

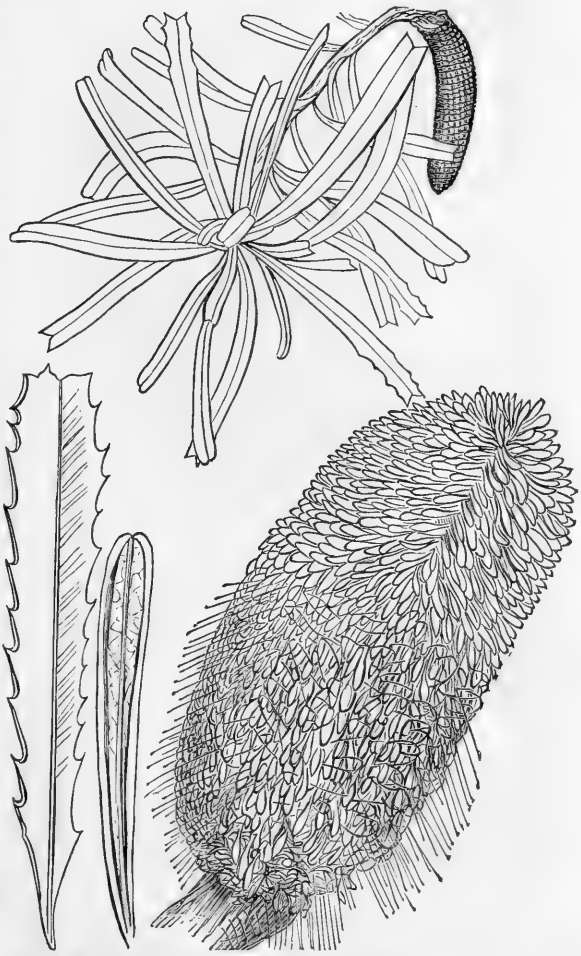


Fig. XX.—(Banksia marginata).—Branches with leaves and flowers.

of leaves from one to four inches. Flowers along and around a cylindric axis, densely crowded into a large oval-cylindric mass, or by a shortened axis occasionally the inflorescence may become almost globular; flowers divided (as in other proteaceous plants) into four calycine or petaline segments, which are less than an inch long, contiguous (not overlapping) at their margin before expansion, and silky outside; the uppermost portion of the segments dilated, at first curved downward and bearing each one stamen; the other portion of the segments very narrow and for a while forming a slender tube. Anthers nearly sessile, narrow-ellipsoid, with an additional small blunt apex, and

Fig. XXI.

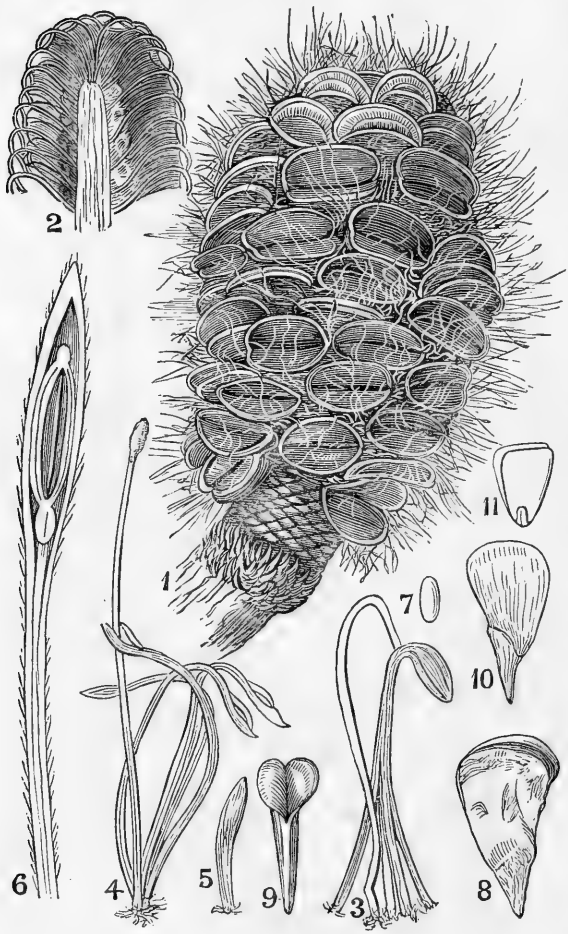


Fig. XXI.—1, ripe fruit; 2, longitudinal section of top of flower-spike; 3, unexpanded flower; 4, expanded flower; 5, bract; 6, sepal with its stamen; 7, pollen-grain; 8, fruitlet; 9, septum; 10, seed; 11, embryo.

with two longitudinal fissures on the inner face. Style setaceous, exserted, smooth, terminated by a minute ellipsoid not streaked stigma. Fruitlets hard, placed transversely on the finally woody axis, surrounded by bracts and remnants of flowers, opening broadly on the summit, compressed and narrowed towards the basis, including a loose septum, which is cleft at its upper portion into two plates. Seeds two in each fruitlet, collateral to the septum, expanded upwards into a comparatively large oval-wedgeshaped membrane; the nucleus pointed towards the base. Albumen none; cotyledons two, compressed, straight; radicle short, placed inferior.

This species ranges from South Queensland to Tasmania and Spencer's Gulf.

Far less frequent than this are all other Victorian Banksias. The Seacoast-Honeysuckle and the Sawleaved-Honeysuckle are mentioned already. The former differs from the common Honeysuckle in taller stature, larger leaves, with more prominent primary transverse veins or nerves and seldom with any teeth, usually also in larger flowers. This extends to Queensland, but not to Tasmania, and with us never leaves the seashores. B. serrata has deeply serrated flat leaves usually green underneath, elongated flowers, a furrowed stigma and thick woody downy fruitlets. This tree advances from Gippsland to New South Wales, and is in Tasmania known only from one place.

Banksia ornata is always of shrubby growth, with leaves similar to those of B. serrata, but the flowers are downy, not silky and different in color. It extends from the Grampians very sparsely to St. Vincent's Gulf, occupying sandy scrub-land.

Banksia spinulosa is our only other species; it received its specific name from the acute teeth of its leaves. It is by far the most handsome among Victorian congeners. The leaves are narrow, white underneath. The cylinders formed by the flowers are long; the segments of the flowers are yellow, outside silky and above an inch long. The style is hooked and usually dark-purple or steel-colored; the summit of the fruitlets is glabrous. Geographic extension from Gippsland to South Queensland.

The Banksiæ attain their maximum number in extra-tropic West Australia, where several species alike magnificent in foliage

and gorgeous in flowers occur. The genus disappears in Central Australia, although all conditions for its occurrence exist there, reappears in North Australia and crosses over to New Guinea.

Proteaceæ are more extensively still represented in Victoria by the well known genera Grevillea and Hakea, the former dedicated to the Right Honorable Charl. Franc. Greville, of Paddington, the latter genus named in honor of Baron Hake, of Hanover, both having been alike patrons of horticulture at the end of the last century. It is easy to distinguish these genera from Banksia ; the segments of the flowers are usually of unequal length and revolute while in bud, never crowded on a woody axis ; the fruitlets become not consolidated and contain no septum. The distinctions between Grevillea and Hakea are faint, several species mediating the transit from one genus to the other. In most Grevilleas however the fruitlets are not of the woody hardness of those of all the Hakeas, while the membrane, which terminates the seeds of Hakeas in nearly all instances, is either absent or equally surrounding the seeds of Grevilleas, and never black as in Hakeas ; thus the nucleus of the winged seeds of the Hakeas is nearly always eccentric. Moreover the flowers of Grevilleas are in most instances terminal, those of the Hakeas mostly axillary. Many species of either genus are highly ornamental, while the form of the leaves of some is very odd ; their foliage is always thick, often rigid, not rarely pungent. These plants form a prominent feature in our scrub-vegetation ; none of the Victorian species is truly arborescent, but in the tropic and subtropic regions of Australia they attain to arboreous growth ; one of the most noble of these trees being Grevillea robusta of the northern coast-forests of New South Wales and the southern woodlands of Queensland, one of our most eligible among avenue-trees, and now chiefly through the writer's actions one of the most accessible garden-species for local studies also. To demonstrate characteristics the description is given of one of the few widely distributed Victorian species, which was discovered in West Australia by Baron Von Huegel in 1833 :

Grevillea Huegelii.—Leaves pinnately cleft into 3–9 segments, glabrous above, doubly grooved and somewhat silky beneath ; all

segments entire or the lower ones again cleft, broad-linear, short, very thick though flat, pungent at the apex, with stalklike base. Racemes or corymbs sessile, consisting usually of not very many flowers; the general flowerstalk (peduncle) as well as the branchlets silky or velvet downy. Stalklets (pedicels) quarter of an inch or less long, as in nearly all Grevilleas and Hakeas placed in pairs above a small solitary bract, diagonally dilated at the summit. Calyx (or perhaps corolla) red, less curved than in most congeners, about two-thirds of an inch long, tubular towards the base, slit longitudinally on the upper side, slightly contracted below the summit, upwards forming four not

Fig. XXII.

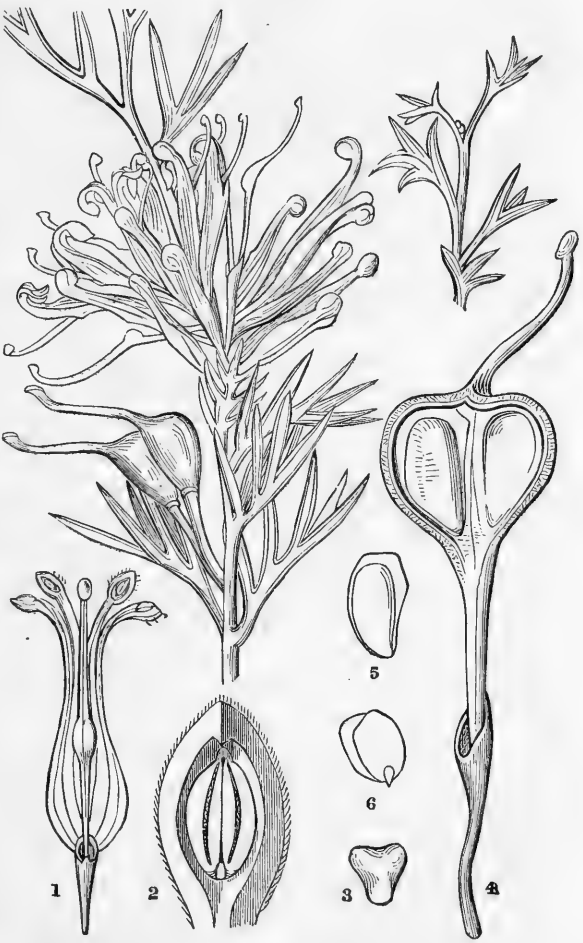


Fig. XXII.—(Grevillea Huegelii).—1, flower laid open; 2, summit of sepal or petal, with its anther; 3, pollen-grain; 4, fruit laid open; 5, seed; 6, embryo.

very unequal lobes, indicating the four partly connate sepals (or petals), silky outside, glabrous inside. Anthers oval, almost sessile in the cavities near the summits of the sepals. Style not much longer than the calyx, glabrous, persistent. Stigma almost lateral, roundish-oval. Fruit provided with a long special stalklet, bivalved, compressed, oblique, oval, protracted at the base, scarcely half an inch long. Seeds oblique-ovate, plan-convex, with a very narrow membraneous margin. Albumen none. Cotyledons straight; radicle basal, very minute.

In the desert at the Murray-River.

In comparing the flowers of a Mistletoe (see Fig. XIX.) with those of a Grevillea and of many other proteaceous plants, a great resemblance in structure must be apparent, particularly when the floral envelope of the Proteaceæ is regarded as consisting of petals (not sepals). This view seems to receive confirmation from some Grevilleas, like G. Huegelii, in which a distinct calycine base of the flowers with an adnate gland is by an oblique descending line separated from the petaline portion of the flowers. It has been shown already, that in the allied order of Santalaceæ genera are contained as well with superiorly as inferiorly placed fruits; hence merely the inferior ovary of Loranthaceæ and the superior ovary of Proteaceæ place these orders not so far apart as other families of plants, differing in these respects and for this reason brought in different series, for instance those of the Thalamifloræ and Calycifloræ. The contiguous contact of the floral lobes (called valvular preflorescence) is the same in all Loranthaceæ, Santalaceæ and Proteaceæ, and these orders agree likewise in having their stamens opposite to the petals, not alternate as in the majority of dicotyledonous orders. The habit of the terrestrial Nuytsia of West Australia and Atkinsonia of New South Wales among Loranthaceæ is quite that of proteaceous shrubs. The presence of petals not absolutely necessitates the development of a calyx also, as may be seen among Victorian plants in a species of the rutaceous genus Eriostemon (E. pleurandroides from the Grampians), in which the calyx is totally obliterated. The unexceptional uniformity of four sepals or petals in so vast an order as Proteaceæ is the only instance of a very

large assemblage of plants, represented in many widely distant countries, showing no variation thus far.

Before leaving the Grevilleas, it should be remarked, that thirteen species only of about one hundred and fifty of this genus occur within the limits of this colony; one of these is exclusively alpine, and tends with other plants to establish the fact, that the majority of the plants of our snowy mountains are of types represented by the same genera, but often not by the same species, in our lowlands. A rare Grevillea of West Gippsland (G. Barklyana) produced broad lobed leaves, sometimes nearly a foot long. Grevilleas are not known out of Australia

Fig. XXIII.

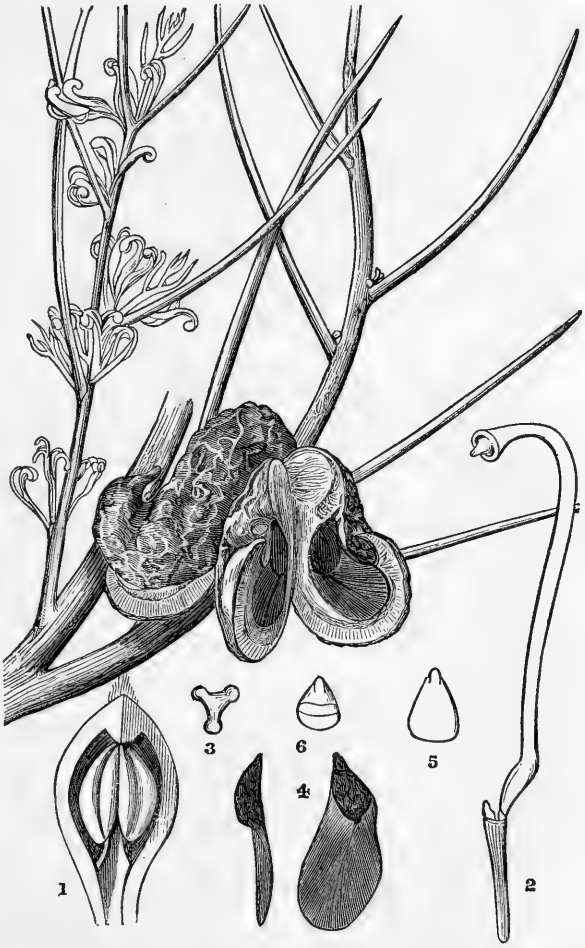


Fig. XXIII.—(Hakea rostrata).—1, summit of sepal or petal with its anther; 2, pistil; 3, pollen-grain; 4, seeds; 5, embryo; 6, transverse section of the same.

except, from New Caledonia, but may perhaps yet be found in New Guinea.

Of the genus Hakea ten species are known to occur in our colony out of about one hundred distributed over all Australia, none as yet having been noted beyond. Adduced as an example:

Hakea rostrata (the beak-fruited Hakea).—Leaves threadlike-cylindrical, undivided, rigid, pungent, glabrous, 4 inches or less long, not furrowed. Flowers axillary, clustered, silky as well as their short stalklets, about $\frac{1}{3}$ of an inch long, downward cylindrical, recurved towards the globular summit, seceding into four white or pink petals (or sepals); style glabrous, short-exserted; stigma terminal, depressed-conical; ovary almost sessile, glabrous; fruit nearly $1\frac{1}{2}$ inches long, woody, bivalved, almost oblique-oval in outline, wrinkled on the sides, the beaklike long apex much inflexed; seeds black (as in nearly all Hakeas), one to each valve, a cavity in the latter fitting to the convex outer rough side of the nucleus, which is oval-wedgeshaped, and much shorter than the terminal membranous upwards oval appendage.

This species is dispersed from the Grampians to Spencer's Gulf, particularly growing on mountainous scrub-lands.

It differs from the other Victorian congeners, except H. rugosa (a smaller plant) and the flat-leaved H. ulicina, in its conical stigma. Our only yellow-flowered species is H. nodosa. Besides Banksias, Grevilleas and Hakeas our colony produces representatives of the proteaceous genera Isopogon, Adenanthos, Conospermum, Persoonia, Orites (alpine), Telopea (the Gippsland Waratah) and Lomatia; but the species of any of them are few or solitary here.

VIII.—THE ASTERS, DAISIES, EVERLASTINGS AND ALLIED PLANTS.

The great order, which comprises these kinds and cognate plants, was called already by Vaillant in the beginning of the last century

Compositæ, because what appears at a passing glance to be a single flower, is composed of usually numerous florets. The number of species, comprised within the order of Compositæ is estimated at about 10,000, this being about one-third more than that of the vast order of Leguminosæ, so far as hitherto ascertained. The Thistles, Lettuce, Dahlia, Chamomile, Dandelion, Chrysanthemums are familiar examples of Compositæ. Not less than 200 plants of this order are indigenous to the Victorian colony, and others have immigrated often to a predominating extent of individual growth. The main characteristics of the composite plants consist in an involucre of bracts surrounding several or many flowers ; calyx-tube connate with the fruit ; calyx-limb (pappus) formed of hair, plumes, bristles or scales or absent altogether ; corolla placed superiorly, with lobes contiguous (valvate) in bud; stamens five rarely four; anthers cylindrically connate, their two cells bursting at the inner side longitudinally ; stigma two-cleft or undivided ; ovary one-celled, with a solitary erect ovule ; fruit (achenium) inferior, indehiscent ; seed without albumen ; embryo straight. Stipules none ; leaves never divided into real leaflets ; flowers mostly small. Compositæ are much oftener herbs than shrubs and very rarely of arborerous growth, trees of gigantic size being unknown in the order. We have however in wet forest-valleys of this colony two trees of Compositæ, the Musk-tree (Aster argophyllus) and the Duke of Bedford's tree (Senecio Bedfordi). Many other species of these two genera are Victorian, and one Aster is chosen to exemplify specific characteristics :

The Velvet-Aster (Aster pannosus).—Shrubby; leaves scattered, on short stalks, generally from 2 to 3 inches long, lanceolar-oval or somewhat heartshaped, entire, above soon glabrous and wrinkled, beneath as well as the branchlets and flowerstalks velvety or somewhat woolly from intricate pale or slightly brown centrifixed hair ; flowerstalks elongated, bearing a few diminutive leaves ; involucre almost bell-shaped, nearly an inch long, consisting of several rows of lanceolar appressed bracts ; receptacle convex, alveolar, without bracts or bracteoles ; flowers all tubular ; those of the ray expanded into a large whitish lanceolar entire or two-

teethed lamina and bearing no perfect stamens; tube of the numerous other flowers yellowish, somewhat dilated above the middle, and divided at the summit into five short equal lobes; filaments free; anthers tipped by a lanceolar membrane, at the base not appendiculated; pollen-grains spherical, covered with raised acute points; style short-exserted; stigmas semi-cylindric; fruit cylindrical, almost $\frac{1}{4}$ of an inch long, finely downy, narrowed at the base. Bristles of the pappus numerous, placed in several rows, longer than the fruit, rough, the outer exceeded by the inner ones in length.

Fig. XXIV.

Fig. XXIV.—(Aster pannosus).—1, a ray-flower and fruit; 2, a disk-flower and fruit; 3, corolla and cylinder of stamens laid open, many times enlarged; 4, pollen-grains, the latter magnified 300 times in linear augmentation.

On Mount McIvor and a few other places of the western districts, thence to Spencer's Gulf.

Asters are distinguished from

Daisies easily by the long hair or bristlets, which constitute the limb of the calyx, the latter in Daisies being very short or altogether undeveloped; moreover the bracts surrounding the florets of Asters form usually several rows, whereas in Daisies they are generally reduced to two rows. Asters have never the tube of the fruit-calyx expanded into membranes, as not rarely is the case with Daisies, the latter being also mostly smaller plants. Species with almost rayless flowers occur in both genera, but are rare. The Burr-Daisies are comprised within the genus Calotis, so named by R. Brown, because two earshaped membranes of pretty appearance terminate along with short barbed spines the fruits of a few species.

FIG. XXV.

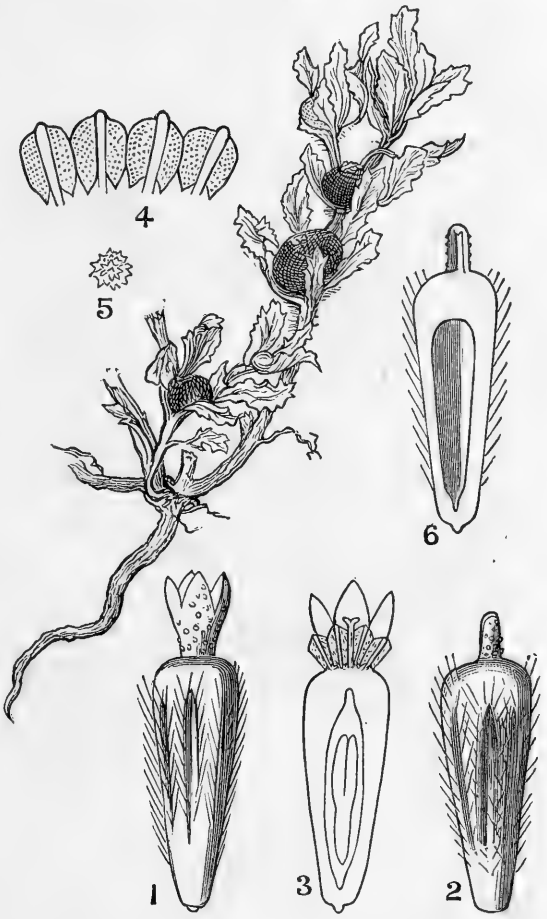


FIG. XXV.—(Cotula Cunninghami).—1, a central flower with its fruit; 2, a marginal flower with its fruit; 3, longitudinal section of a central flower and fruit; 4, stamens, laid free by expansion; 5, a pollen-grain, 250 times magnified; 6, longitudinal section of a marginal flower; 1, 2, 3, 4, and 6 many times magnified.

One of the most common of our native weeds, and one of irritating acridity, exciting like Arnica-flowers sneezing, is chosen to contrast the reduction and minuteness of the floral organs in numerous of our composite plants, when compared to those of a conspicuously flowered Aster, such as alluded to in the last pages:

The Sneeze-weed (Cotula or Centipeda Cunninghami).—A dwarf erect or adscendent odorous herb, glabrous or downy; leaves scattered, less than an inch long, lanceolar- or oblong-wedge-shaped, somewhat crisp, sessile, along the margin toothed; flower-heads axillary, solitary, sessile, depressed-globose or hemispheric; bracts in two rows, very short, pellucid at the margin; flowers in each head very numerous; only the central flowers bearing stamens; corolla of all the outer flowers exceedingly minute, tubular; corolla of the central flowers dilated, four-lobed and very short; anthers four, nearly sessile, short-lobed at the base; stigmas very short, blunt; fruits minute, clubshaped-cylindric, striped from below the turgid summit; pappus none.

The name Cotula, a diminutive, originated from some affinity of this genus to a spurious Chamomile, known in olden times as Cota.

This herb grows particularly on river-banks, around swamps and on moist meadows, extending to Central and West Australia, but not to Tasmania. An allied species (Cotula minuta or Myriogyne minuta) differs in prostrate and less robust habit, leaves toothless towards the base, short-stalked flower-heads, bracts hardly pellucid along their margin, less copious florets, more ellipsoid fruits with streaks to near the summit. It occurs sometimes promiscuously with Cotula Cunninghami, but is preferentially a plant of forest-tracts, ascends higher mountain-regions, and while C. Cunninghami is an endemic Continental Australian always extra-tropic plant, C. minuta extends to South Asia, thence eastward to Japan, southward to New Zealand, and reappears in Valdivia and Mauritius and the South Sea Islands also. The odor of C. minuta is more pleasant than that of the other species; both can be converted into snuff.

Our everlastings are numerous, mostly pretty and often gregarious, particularly the desert-species. They belong chiefly

to two genera, Helichrysum and Helipterum, so called because some species of the former with golden-yellow flower-heads resemble the sunflower in miniature, while the Helipterums differ in having not the denticulated pappus-hair of Helichrysum, but plumes forming the pappus. Thus these two genera differ almost from each other like the ordinary Thistles from the Plum-thistles. The name of the ordinary large and yellow-flowered everlasting is Helichrysum lucidum. The ray of these plants is formed by the inner elongated bracts (or involucre-scales), not by the outer flowers as in Chamomiles, Chrysanthemums, Asters, Daisies, the Capeweed (Cryptostemma calendulaceum) and many other genera of Composites. The bracts of everlastings may vary white, pink or yellow in the same species. A dwarf perennial composite herb, with leaves reminding of those of Primroses, and with small yellow ray-flowers frequents our pastures ; this is the Cymbonotus Lawsonianus ; it is geographically remarkable as the only plant of the large Arctotis-tribe known as indigenous beyond Africa. The enormous genus Senecio, counting nearly one thousand species in all parts of the globe (absent in North Australia), is represented in our colony by many and chiefly yellow-rayed species. The involucre consists only of one series of bracts, which are connate and give the appearance of a calyx. The Cineraria of the Canary Islands (Senecio cruentus), which is such a favorite for window-culture, demonstrates well the general structure of these kinds of plants ; they as a rule possess a peculiar somewhat aromatic odor.

IX.—THE BELLFLOWER, LOBELIAS, GOODENIAS AND ALLIED PLANTS.

Australia possesses of the beautiful genus of Bellflowers only one species, *Campanula gracilis*, and this plant, when growing copiously gives occasionally to our meadows that blue tint, which

is so frequently seen on the grasslands of Europe, Asia and South Africa, but so rarely to be met with in Australian vegetation. Our Campanula is not even strictly referable to that genus, as modernly defined, but must be placed into the genus Wahlenbergia, which was dedicated to Professor G. Wahlenberg of Upsala, a most meritorious writer on European plants in the earlier part of this century. The Wahlenbergias differ merely from the genuine Campanulas by terminal not lateral dehiscence of the fruit with five valves or teeth. In both genera the stamens are quite disconnected, whereas in our well-known Lobelias, which belong likewise to the order of Campanulaceæ, the anthers are united into a tube around the style, by which

FIG. XXVI.

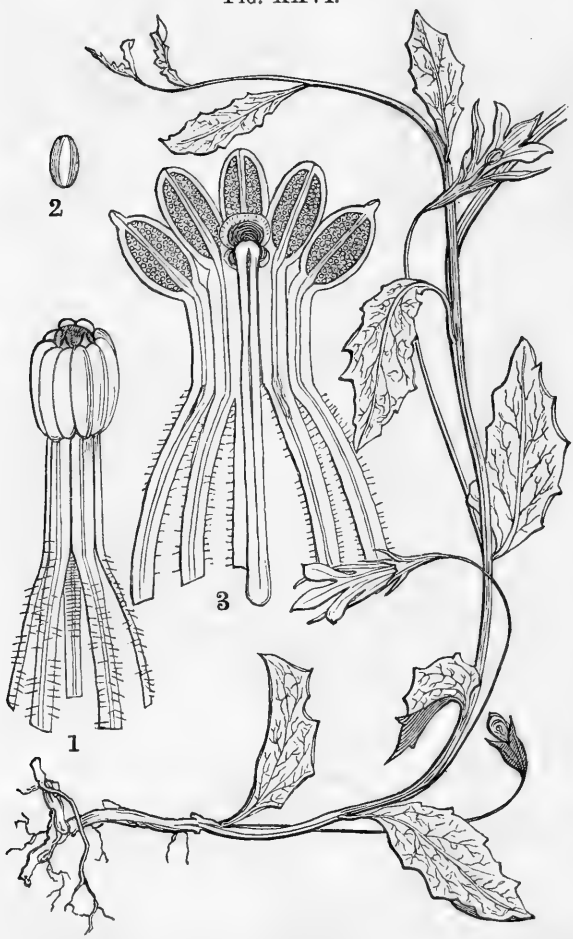


FIG. XXVI.—(Lobelia purpurascens).—1, column of stamens much enlarged; 2, pollen-grain, 300 times magnified; 3, column of stamens opened, also style and its stigma.

means some affinity to the order of Compositæ is demonstrated. Unlike to the Bellflowers the corolla of the Lobelias is not symmetrically shaped, but slit along the upper side and has the two upper lobes smaller than the three lower ones, thus a two-lipped corolla being formed; the fruit of Lobelias moreover opens with two terminal valves. That the milk-sap of Lobeliaceæ contains an acrid poisonous principle (Lobelin) is well known, and losses of pastoral animals are often sustained in our colony by their feeding on these herbs, particularly at seasons, when grasses and other fodder-plants are scarce. Twelve Lobelias occur in Victoria and two of the allied genus Isotoma, which differs in no other respect than the uncleft tube of the corolla. Isotoma axillaris is a large-flowered showy plant, occurring in fissures of granite-rocks of the North-East portion of our territory. Some small creeping Lobelias are alpine. The following representative is described and figured:

Lobelia purpurascens.—A perennial glabrous herb, with procumbent angular stems. Leaves on very short petioles, oval-lanceolar, irregularly toothed, half to one inch long. Flower-stalks axillary, solitary, exceeding the leaves in length, one-flowered, recurved towards the summit. Flowers unisexual; lobes of the calyx 5, narrow, acute, persistent; tube obverse conical in the pistillate flowers, less conspicuous in the staminate flowers. Corolla hardly half an inch long; the three lower lobes wedgeshaped-lanceolar, the two upper much narrower and more acute. Filaments connate towards the summit. Anthers unbearded, the two lower ones terminated by minute bristlets; those of the seed-bearing flowers diminute and sterile. Pollen grains ellipsoid, bursting lengthwise. Style slender; stigma broad, unequally bilobed. Fruit connate with the tube of the calyx, two-celled. Seeds numerous, minute, compressed, albuminous. Embryo straight.

This species is an inhabitant of East Gippsland, passing thence to South Queensland.

The Campanulaceæ conduct us through close affinity to the important orders of Goodeniaceæ and Stylideæ; both are mainly Australian and have special interest on account of the curious

Fig. XXVII.

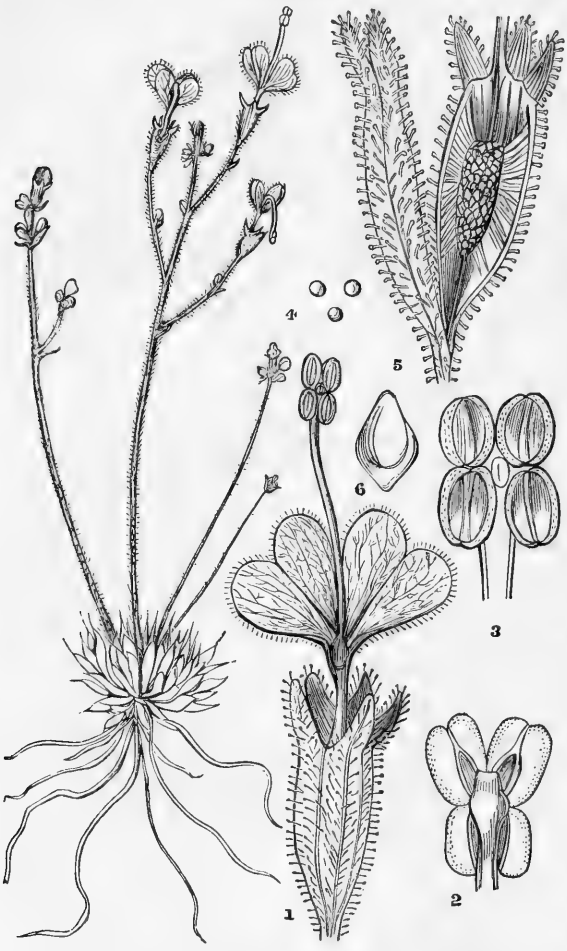


Fig. XXVII.—(Stylidium soboliferum).—1, a flower; 2, back view of anthers; 3, front view of anthers; 4, pollen-grains; 5, fruit, opened; 6, a seed.

structure of their flowers. In Stylidium the fifth lobe of the corolla becomes diminutive, the stamens are reduced to two, connate with the style into a column, and this column in a quiescent state is recumbent in the direction of the diminutive lobe of the corolla, but at the slightest touch jumps upwards, gradually returning to its reclined position.

The reverse is the case in the Leeuwenhœkeas; in them the diminutive lobe of the corolla is the irritable part, while the columna is unmovable. The minute annual Leeuwenhœkia dubia is common on our pastures in early spring. The genus bears the name of a celebrated Dutch physio-

logist and anatomist, whose many discoveries were made at the end of the seventeenth and at the beginning of the eighteenth century.

Of Stylidiums several species occur in Victoria, one only being common, the Stylidium graminifolium, with grass-like leaves all radical, with stem-like flowerstalks, and with spikes of red pretty flowers.

More important here are the Goodeniaceæ, because the members of this order in our colony are numerous, thirty species having been detected in Victoria. Many of them are besides of medicinal utility, as they possess a bitter tonic principle not dissimilar to that of the Gentians. To the gentianeous family they are also otherwise very closely related, the genus Limnanthemum among Gentianeæ differing from Velleya among Goodeniaceæ mainly in the symmetrical

Fig. XXVIII.

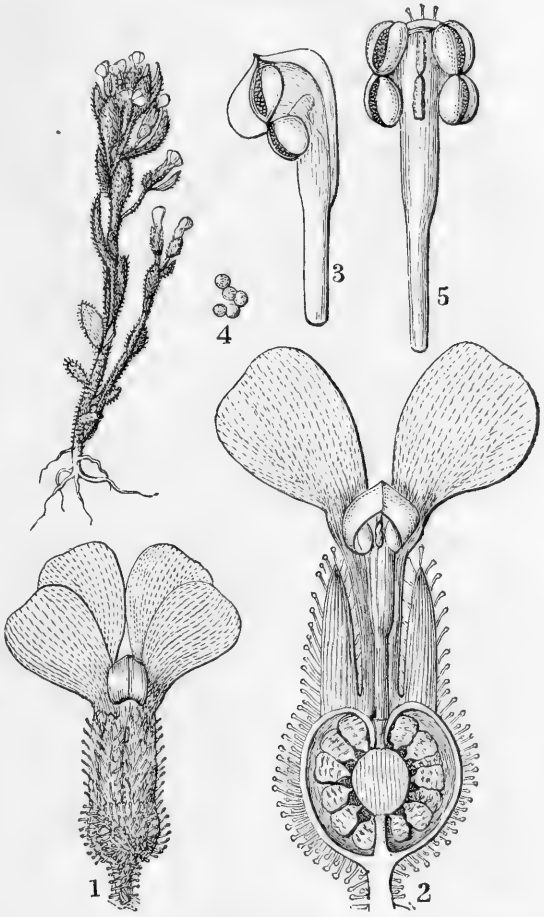


Fig. XXVIII.—(Leeuwenhœkea dubia).—1, a flower; 2, longitudinal section of a flower; 3, side view of column with labellum; 4, pollen-grains; 5, front view of column; all much magnified.

flower and the want of a special covering (indusium) of the stigma, the last-mentioned characteristic being the one on which the order mainly rests. The genus Velleya was named in honor of Colonel Velley, an author on algæ at the end of last century. The occasional fallibility of the most salient characteristic of the position of the fruit, whether within the calyx and adnate or free from it, is observable in Velleya; for while all other goodeniaceous genera have the fruit placed inferiorly, it is superior in Velleya. The order derives its name from Dr. Goodenough, Bishop of Carlisle, a scientific worker on British Algæ and sedges late in the last century. The genus Goodenia, though in its etymology strangely abbreviated by Sir James Smith, serves now also as a monument to the Bishop's grandson, Commodore Goodenough, who succumbed to arrow-wounds, inflicted by the savages of Santa Cruz. As an example the description of one Goodenia is given, one of our rarest species, dedicated to the discoverer of Gippsland:

Goodenia Macmillani.—A perennial herb, erect or adscendent, all over glandular; leaves dissected into lobes and besides denticulated; their lower lobes the smallest, the upper lobe far larger than the rest and often triangular or cordate- or oval-lanceolar. Flowers axillary, solitary; stalk angular, usually shorter than the flower, jointed at the summit, with two minute narrow bracteoles at the base; lobes of the calyx five, persistent, narrow and acute. Corolla about one inch long, purple, cleft to near the base; the two upper lobes deeper separated than the three lower lobes; each consisting of a lanceolar plate and membranous broad margin, the latter bilobed at the summit and before expansion inflected; the very short tube slit along the upper side, and at the base produced into a slight gibbosity, the inner side somewhat downy and papillar. Stamens five; filaments threadlike; anthers oblong, fixed at the base, slit longitudinally along each of their two cells, Style filiform, downy, curved at the apex, around the orifice of the indusium white silky-fringed. Fruit cylindric-ellipsoid, bilocular from a septum, which extends to near the summit of the cavity, where it is semicircular-excised. Seeds in two rows on each side of the septum, ovate-orbicular, brown-yellow, finely

dotted, thickened at the margin. Embryo erect, lodged in the middle of the albumen; the cylindric radicle about as long as the oval cotyledons.

Like Goodenia so the coordinal Scævola and Dampiera comprise shrubby as well as herbaceous species; Scævola (including Verreauxia) is almost the only genus, by which the order is represented beyond Australia. This genus received its name, because the corolla is unilaterally expanded and almost hand-shaped. It differs from Goodenia in indehiscent one- or two-seeded fruit; while Dampiera, dedicated to the navigator, who discovered a portion of

Fig. XXIX.

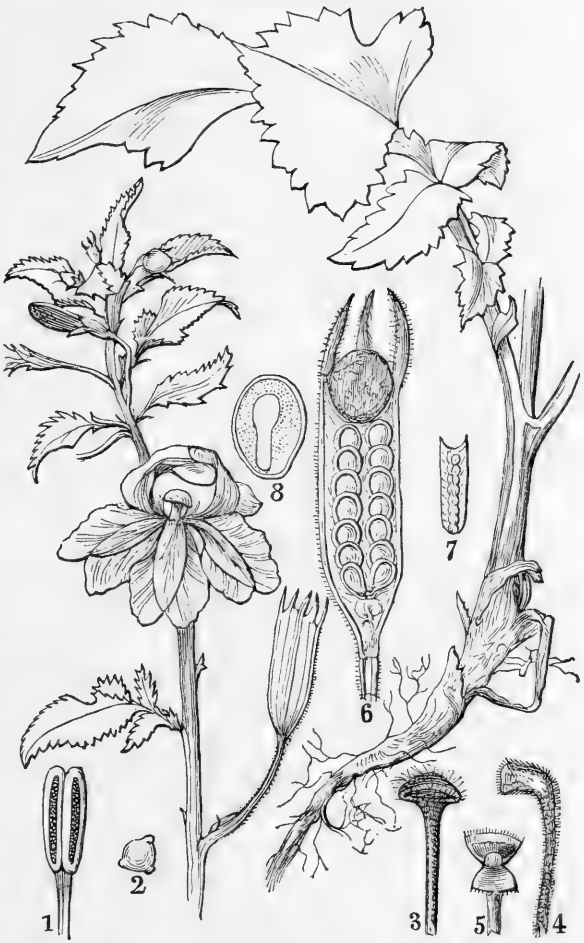


Fig. XXIX.—(Goodenia Macmillani).—1, front view of an anther; 2, pollen-grain, 300 times enlarged; 3, front-view of style; 4, lateral view of the same; 5, indusium slit open to show the stigma; 6, longitudinal section of fruit; 7, septum, natural size; 8, longitudinal section of a seed; 1, 3, 4, 5, 6 and 8 magnified many times.

North-West Australia and who published the first drawings of Australian plants, recedes from Scævola principally in its anthers, connate like in Compositæ and in Lobeliaceæ. There remains to be noted a herb of this order, with radical leaves and a head of pretty blue flowers, frequent on many of our meadows in spring; it is the Brunonia Australis, on which the name of Robert Brown, the Naturalist of Flinders's Expedition, and the main founder of the knowledge of Australian plants, has been bestowed. The Brunonia is distinguished from Dampiera by the unslit tube of its corolla, by the free calyx and albuminous seed.

X.—THE HEATHS

AND ALLIED PLANTS.

Only two plants of this colony, the alpine Waxberry-bush (Gaultiera hispida) and the Whortleberry-bush of Mount Baw Baw (Wittsteinia vacciniacea) belong to the heath-tribe in the truly scientific meaning of the word; because all other heathlike plants of Continental Australia pertain to the allied order of Epacrideæ, distinguished from the true Heaths by their one-celled (never two-celled) anthers, which latter moreover never exceed in number the lobes of the calyx and corolla, nor open with pores, as is frequently the case with true Heaths or Ericaceæ. About three hundred Australian species of Epacrideæ are known, few existing beyond Australia and none in the northern hemisphere except the Sandwich Islands; forty are found within the boundaries of our colony. A predilection exists of gathering these plants for collections; hence a brief outline of our genera is given, which may serve likewise to demonstrate the particular value of characteristics for generic discrimination. The sepals are normally five in all our species; and to this corresponds the

number of corolla-lobes, and also of stamens. The anthers of all Victorian Epacrideæ are fixed at the back.

Styphelia: Corolla cylindric or bellshaped; its lobes contiguous at the margin while in bud. Filaments adnate to the corolla. Anthers separated. Ovary 2–5-celled, rarely with more cells; each cell with one ovule. Fruit drupaceous, with an undivided putamen (stone or core). Leafstalks articulated at the place of insertion.

Brachyloma: Characters of Styphelia, but the lobes of the corolla overlapping in bud.

Monotoca: Characters of Styphelia, but the ovary one-celled, with one ovule.

Trochocarpa: Characters of Styphelia, but the putamen cleft into 5–10 lobes or divisions.

Epacris: Corolla cylindric or funnelshaped or bellshaped; its lobes overlapping before expansion. Filaments adnate or adherent to the corolla. Anthers separated, entire. Fruit five-celled, dehiscent (capsular). Seeds numerous. Leafstalks articulated at the place of insertion.

Richea: Corolla conical-cylindric; its minute lobes not expanding; its tube circumcised at the base. Filaments free from the corolla. Anthers separated, entire, or cleft into two lobes. Fruit of Epacris. Leaves clasping the branchlets, not articulated at their persistent base.

Sprengelia: Corolla cylindric, bellshaped or rotate; its lobes contiguous at the whole or lower margin before expansion. Filaments free from the corolla. Anthers separated or coherent. Fruit and leaves of Richea.

From these notes it will be seen, that Epacrideæ are divisible into two main-groups, those with drupaceous fruits and those with capsular fruits. Styphelia is the genus richest in species, and comprises the subgenera Astroloma, Melichrus, Stenanthera, Cyathodes, Lissanthe, Acrotriche and Leucopogon. Most of our species belong to the section Leucopogon, named so because the lobes of the corolla are inside white-bearded. As a representative the following Styphelia, one of the most brilliant plants of the whole order, is briefly described:

Styphelia Sonderi: A dwarf shrub, with downy branchlets. Leaves almost sessile, rigid, broad-linear or narrow-lanceolar, recurved and subtle fringed at the margin, streaked and downybeneath, acicular at the apex, one inch or less long. Flowers axillary, solitary, nearly sessile. Bracts several, surrounding the calyx, stiff, shining; the inner ones gradually much larger and resembling the two bracteoles, lanceolar- or roundish-oval; sepals incurved, half to two-thirds of an inch long, similar in texture to the bracts, but more lanceolar, overlapping at the margin, often assuming a red tint. Corolla tubu-

FIG. XXX.

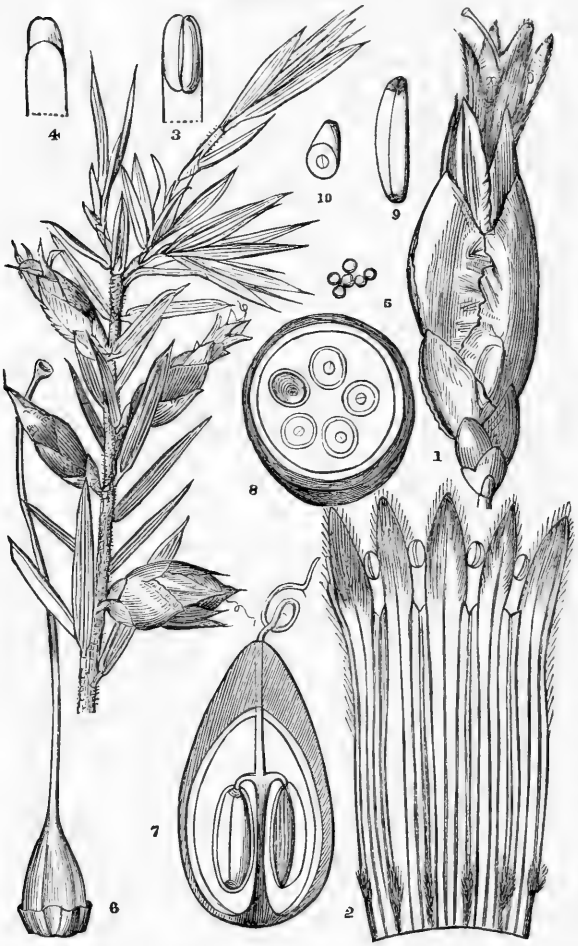


FIG. XXX.—(Styphelia Sonderi).—1, a flower; 2, corolla with stamens laid open; 3, an anther with portion of the filament, anterior view; 4, the same, posterior view; 5, pollen-grains; 6, pistil; 7, longitudinal section of fruit; 8, transverse section of fruit, one seed removed; 9, a seed; 10, transverse section of a seed. All much enlarged.

lar, short-exserted, half to two-thirds of an inch long, of a fulgent red, very rarely white or yellow; the lobes semilanceolar, much shorter than the tube, with a portion of which outside appressed-downy; the tube bearded inside at the base and opposite to the adnate filaments by fringed scales or grooves; filaments free at the summit and flat; anthers fixed at the inner apex of the filament, erect, broad-oval, opening with one longitudinal slit. Style thread-like; stigma minute, roundish; disk around the ovary undivided. Fruit oval, pulpless, nearly as long as the calyx, of woody hardness, oval, five-celled. Seeds ellipsoid, albuminous; embryo straight. This Styphelia was named in honor of Dr. Sonder of Hamburg, who largely extended the knowledge of the Epacrideæ. It has its geographic limits within West Victoria and South Australia.

We pass now on to the beautiful genus Epacris, one species of which for the often brilliant red flowers and the copiousness of its appearance is a great ornament in the native vegetation. This is the *Epacris impressa*, which in all its variations remains readily recognised by the five impressions at the base of the corolla, alternate with the stamens. The flowers vary from deep red to pure white in all intermediate shades; but this is our only Epacris, which shows this play of color, the other Victorian species bearing flowers, which with unvaried constancy are white. Three of these are lowlands species, namely E. obtusifolia, E. lanuginosa and E. microphylla, while three others are exclusively alpine, viz., E. heteronema, E. petrophila and E. serpillifolia. The generic name was applied, because some of the species are restricted to summits of mountain-ranges. Our only Richea (one out of eight alpine Tasmanian) bears the name of one of the naturalists of D'Entrecasteaux's Expedition. This one (R. Gunnii), named in honor of Ronald Gunn, Esq., of Launceston, forms by its dense tall growth and prickly foliage a great impediment to travellers on the mossy moors of the Australian Alps. Our only Sprengelia (S. incarnata) fills many of the moory swamps of the southern and eastern regions of our territory, attaining a height of many feet.

XI.—THE CORREAS
AND ALLIED PLANTS.

With all wish to maintain vernacular names, which are not actually misleading, I cannot call a Correa by the common colonial name "native Fuchsia," as not the slightest structural resemblance and but little habitual similarity exists between these plants ; they indeed belong to widely different orders. If a Fuchsia in any garden is compared with a Correa and also a plant of the Myrtle-family, it will at once be apparent, that its affinity is really much greater to the latter than to what popularly passes here as Fuchsia. It ought to be an aim of every educational establishment to banish appellations, which arose from totally erroneous conceptions or distort the logic meanings of well understood objects. All languages are rich enough, to construct from them names free from ambiguity and devoid of aptness to cause confusion. The Correas received their name with a view of commemorating the merits of Correa de Serra, a Portuguese nobleman, who wrote at the beginning of this century on *rutaceous plants*, to which this genus belongs. The Correas are not only remarkable for their beauty, but also for the structural organization of their flowers, which introduces exceptionally into an order of plants with disjointed petals the tubular (monopetalous or synpetalous) corolla of such orders of which Goodeniaceæ, Campanulaceæ, Ericeæ and Compositæ (see foregoing pages) are examples. Similarly in other orders occur genera with free and with coherent petals ; of this are well-known Australian instances Galium and Asperula among Rubiaceæ, Viscum and Loranthus (among Loranthaceæ), Notelæa (spurious Olive) and Ligustrum (Privet) among Oleaceæ, Lysinema and Epacris among Epacrideæ, Samara and Myrsine among Myrsineæ. This is particularly mentioned here, to impress on the student, that in a natural arrangement of plants (such as that of Jussieu) not a solitary characteristic can be implicitly relied on, as in any artificial system (such as that of the great Linné), but that the

complex of leading characteristics forms the basis for classification.

All Correas are geographically restricted to the South-eastern portion of the Australian continent and Tasmania, the genus counting but few species. The ordinary Correa, C. speciosa, varies with scarlet and green or sometimes yellowish flowers, the summit being always green. The flowers of the Sea-coast Correa, C. alba, are short and white and somewhat resemble those of a Styrax. The subalpine Correa, C. Lawrenciana, forms a large bush and constitutes particularly at elevations of 2,000 to 4,000 feet on many places impenetrable jungles. Its lustrous foliage and tall stature render it the grandest of all species ; but as the flowers are usually greenish-yellow, it is not so superb a plant for horticulture as C. speciosa, unless the crimson-flowered variety, one of great rarity, is attainable. As illustrative of the genus and order the description is given of :

Correa æmula.—Leaves opposite, verging from an oval into a lanceolar, oval and frequently heartshaped form, from one to two and a half inches long, conspersed on both pages with stellate hair, dotted with pellucid glands and thus odorous like all other portions of the shrub. Flowerstalks very slender, with one to three pendent flowers. Bracteoles short, narrow and acute. Calyx cleft beyond the middle into four deltoid or semilanceolate long-acuminated lobes. Petals four, connate into a tube, one to one and a half inches long, outside purplish-grey or yellowish-green and covered with minute downs, partially or totally separating in age ; the summit valvular in bud. Stamens eight, short-exserted, the filaments of those opposite to the petals broadly dilated towards the base. Anthers almost ellipsoid, fixed above the base, without terminal appendage, opening on the inner side with two slits. Style smooth, threadlike. Stigma very minute, four-lobed. Disk around the ovary eight-ridged. Fruitlets four, oblique-ovate, cohering into one, bearded particularly at the summit, as long as the calyx, bivalved, one- to two-seeded ; the elastic inner covering of the husk (the endocarp) soon seceding, the round basal opening closed by a placental membrane. Seeds oblique-ellipsoid, about one-eighth of an inch long, shining.

Albumen of almond-consistence. Embryo straight, cylindric; radicle about as long as the cotyledons.

Fig. XXXI.

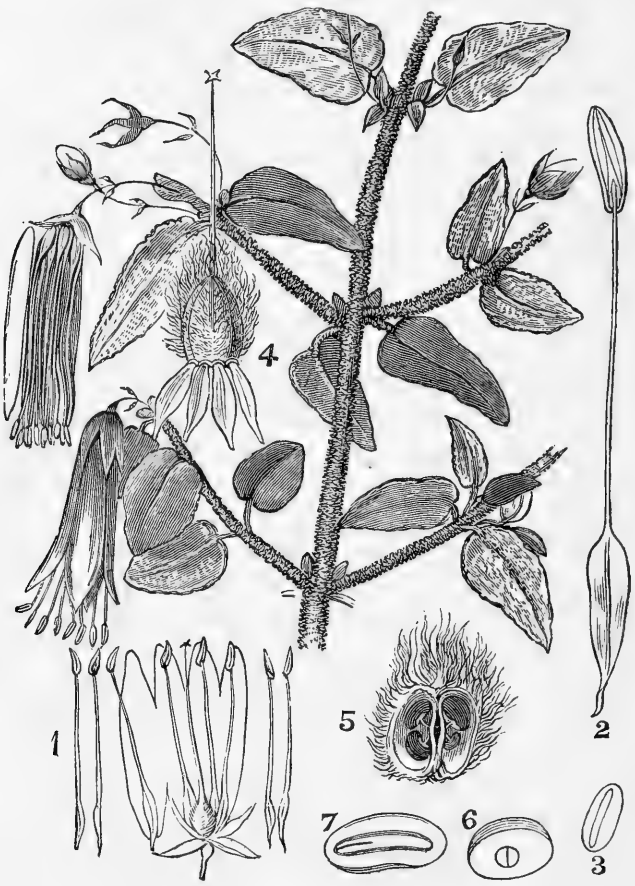


Fig. XXXI.—(Correa æmula).—1, a flower, laid open, four of its stamens severed; 2, one of the petaline stamens; 3, a pollen-grain; 4, pistil, the corolla removed, the calyx moved downward; 5, longitudinal sections of ovaries; 6, transverse section of a seed; 7, longitudinal section of a seed.

The genus nearest allied to Correa is *Boronia*, so named by Sir James Smith in memory of an unfortunate companion of

Dr. Sibthorp during his phytologic travels in Greece late in the last century. The Boronias differ from the Correas in free petals, which are never so large, also in usually shorter stamens, four of which may be sterile or (in the subgenus *Zieria*) be altogether absent. Boronias are scattered over the whole of Australia, rare in New Caledonia (Boronella and Zieridium), possibly present in New Guinea, but absent in New Zealand. Curious is the fact, that the genus Boronia includes species with simple and pinnately or otherwise compound leaves. It is further worthy of special remark, that the petals of Boronia as well as the next genus, namely Eriostemon, are in some species contiguous at the margin, in others overlapping while in bud, whereby one of the firmest characteristics of botanic discrimi-

Fig. XXXII.

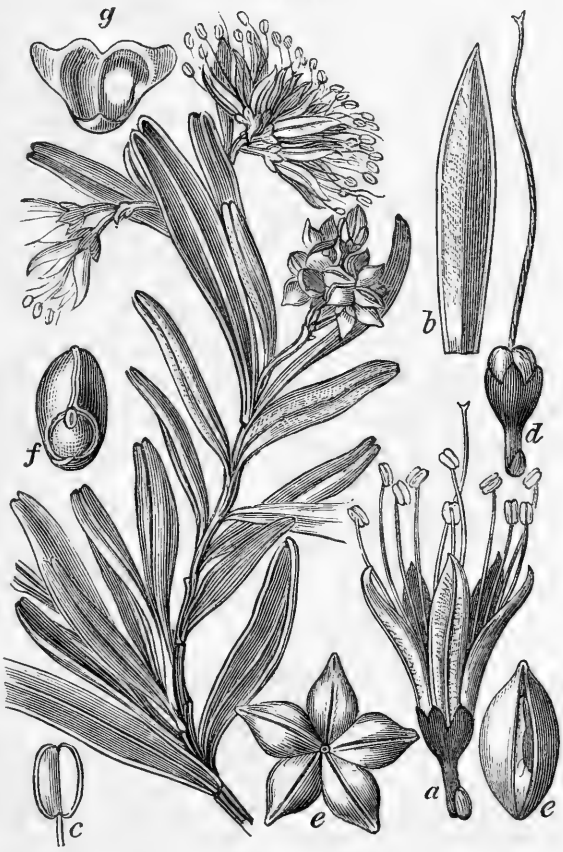


Fig. XXXII.—(Eriostemon Ralstoni).—*a*, a separate flower; *b*, a petal; *c*, an anther; *d*, calyx with pistil, after the lapse of petals and stamens; *e*, fruitlets, seen from above; *f*, a fruitlet, seen from beneath; *g*, inner lamina of the fruit (endocarp).

nation is overthrown in this instance. Eriostemon is separable from Boronia by alternate or scattered never opposite leaves, five lobes of the calyx, five petals, ten stamens and usually five fruitlets; but in one Eriostemon (E. virgatus) the division of the flowers is quaternary, while in one of our Zierias (Z. veronica) the leaves are partly alternate.

Eriostemon is richest in species among Victorian Rutaceæ, the writer having found eighteen within the limits of this colony. Like Boronias they are lovely plants, and both are represented also in our alpine flora. Eriostemon received its name, because the first detected species have woolly stamens; beyond Australia it has a few congeners in New Zealand and New Caledonia. Phebalium, Crowea, Microcybe and Asterolasia are subgenera, in the latter of which the ovary becomes reduced to two or three cells (in particular species) and the calyx (in one) entirely obliterated. All the plants of the genera mentioned are shrubs or half-shrubs, very rarely almost herbs, but one Zieria (Z. Smithii) will attain in our ferntree-gullies to tree-size. A desert-plant of the order, Geijera parviflora, and a noble plant of East Gippsland, Acronychia lævis, verging to the Orange-tribe, are advancing to the height of good-sized trees, evergreen as all the native trees of our zone.

XII.—THE GERANIUMS

AND ALLIED PLANTS.

Under the name of Geraniums are vernacularly comprehended three groups of plants, each of which has claims for generic distinctions. Thus arose out of the ancient Geranium of Dioscorides three separate genera, the modern Geranium, Pelargonium and Erodium. The etymology of these three words is derived from analogous characteristics of all three; the fruit of true Geraniums being compared to the long-beaked head of a

crane ; that of a Pelargonium being fancied to resemble a stork-bill, whereas the name of Erodium was suggested by its supposed resemblance to a heron's beak. As all three are represented here by native plants and numerous species of Pelargonium pass under the name of Geraniums in ordinary gardens, it is deemed desirable to explain the generic differences in schematic form.

Geranium: Calyx devoid of a nectar-tube. Petals five, equal. Stamens ten, usually all fertile, those opposite the sepals provided at the base with an anterior gland. Awnlike prolongations of the fruitlets coiled-seceding from the lengthened fruit-axis and mostly smooth. Cotyledons orbicular, convolute, on one side replicate.—Herbs, very rarely shrubs ; leaves often as broad as long ; flowerstalks one- or two-flowered.

Erodium: Calyx devoid of a nectar-tube. Petals five, equal. Stamens ten ; the five opposite to the petals destitute of anthers ; those opposite to the sepals provided at the base with an anterior gland. Awnlike prolongations of the fruitlets spirally seceding from the lengthened fruit-axis and mostly bearded inside. Cotyledons elliptic, plan-convex, on one side replicate.—Herbs, rarely somewhat shrubby plants ; leaves usually longer than broad ; flowers in umbels, or sometimes one or two only on a stalk.

Pelargonium: Posterior sepal lengthened into a descending nectar-tube ; the latter innate-decurrent along the flower-stalklet. Petals unequal. Stamens ten, often bent downward ; those opposite the petals all or in part destitute of anthers ; those opposite the sepals devoid of an anterior gland. Awnlike prolongations of the fruitlets spirally seceding from the lengthened fruit-axis and partially bearded inside. Cotyledons elliptic, flat or slightly curved.—Herbs or shrubs ; flowers usually in umbels.

The characteristics here explained may be easily ascertained in any garden. Pelargonium, for instance, contains the so-called Scarlet Geranium of South Africa.

Our native species of Pelargonium number only two ; and even these stand to each other in such close affinity, that they might be considered as mere varieties of one. The commoner of the two is scientifically recorded as *Pelargonium australe*, already at the

commencement of Australian colonisation. A herb from a few inches to a few feet high, more or less downy. Leaves heart-shaped or verging into a kidney-shaped or roundish form, lobeless or short-lobed, crenated, measuring from scarcely 1 to 6 inches, all opposite, or rarely the uppermost alternate, traversed by radiating and ramified nerves and divergent veins, more or less waved or sometimes quite crisp. Stipules free, membranous, triangular - lanceolate, persistent, from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in length. Flowerstalks axillary, not opposite, 1–3 inches long, bearing umbels of many or rarely few flowers. Involucre formed of small membranous semi-lanceolar or subulate-linear bracts. Stalklets more frequently shorter than the flowers, than exceeding them in length. Flowers rather fragrant. Segments of the calyx lanceolar, from $\frac{1}{8}$ to $\frac{1}{3}$ of an inch long, three-nerved; nectar-tube short. Petals spatular- or wedge-shaped-ovate, about twice as long as the calyx, entire, at the

Fig. XXXIII.

Fig. XXXIII.—(Pelargonium Rodneyanum).—Natural size of a small variety.

base stalk-like narrowed; the upper one broader than the rest and more copiously veined; the lower petals only streaked by purple, violet or deep-red veins, the upper ones towards the centre often somewhat spotted. Stamens connate at the base; seven generally fertile; the longest nearly half as long as the petals; filaments glabrous, subulate-linear; anthers ellipsoid, purple, fixed at their back; pollen-grains orange-colored, smooth, ovate. Summit of the style glabrous, very thin, deciduous; its five stigmatic lobes or stigmas recurved. Fruitlets five, $\frac{1}{8}$ of an inch or less long, opening laterally, one- or rarely two-seeded; their narrow prolongation $\frac{1}{2}$ to 1 inch measuring in length. Seeds brown-black, not shining. Radicle conic-awlshaped, appressed to the lobeless and incumbent cotyledons.

Fig. XXXIV.

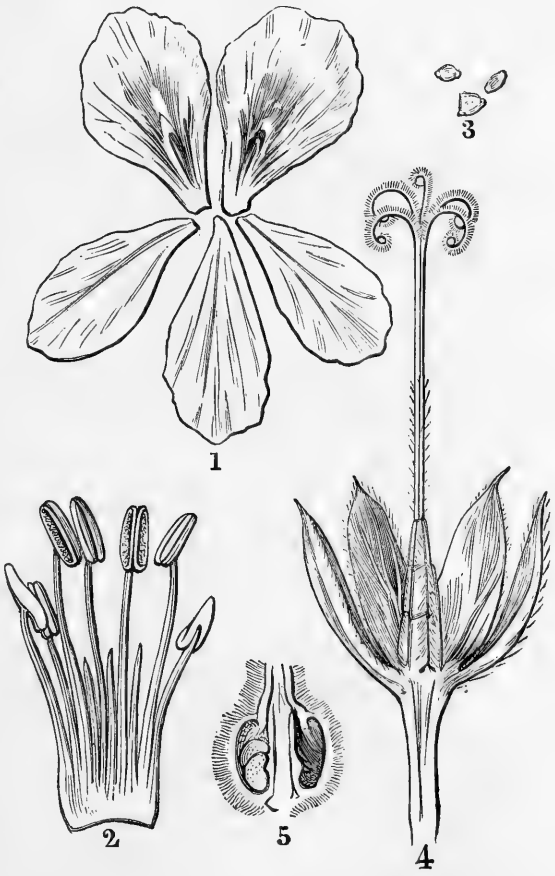


Fig. XXXIV.—1, the five petals; 2, the seven fertile and three sterile stamens; 3, pollen-grains, the lower dry, the upper moistened; 4, pistil with portion of calyx; 5, longitudinal section of ovary.

Our second

Pelargonium is much rarer and also a more showy plant, *Pelargonium Rodneyanum* (Fig. XXXIII.).

Its stem is usually short, sometimes nearly obliterated; the root is often thicker, in proportion to the whole plant large and usually somewhat woody; the leaves are mostly rhombeshaped-oval; the flowers are manifestly larger and of a deeper red; the sterile stamens and the styles are longer, and the fruit, which is seldom developed, is larger.

This plant adapts itself particularly to clayey pasture-land. Our only indigenous Geranium and Erodium will be easily recognised by contrasting the generic characteristics, but to facilitate still more the recognition some brief specific notes of each are given :—

Geranium dissectum.—Diffuse or procumbent, hairy. Root here somewhat tuberous and perennial, in colder climates often thin and annual. Leaves mostly long-stalked, in outline heart-shaped- or kidneyshaped-orbicular, deeply 5–7 cleft; their primary partitions cut into three or more lobes, some rarely entire; flowerstalks usually long, bearing one or two flowers, bent down in age. Flowers small; sepals pointed; petals wedge-shaped, oval, entire or slightly excised at the summit, pale or pink, scantily downy at the base. Stamens shorter than the calyx, subtle-downy towards the base, short-connate; glands smooth; styles finely downy as well as the fruitlets, the latter not wrinkled; seeds netted-rough outside.

The roots used for food by the aborigines. An alpine variety is stemless, with sessile flowers on only very short flowerstalks.

This plant is widely dispersed over the globe, whereas our Erodium is confined to Australia.

Erodium cygnorum.—Short-hairy. Leaves trisected; their lobes almost rhombeshaped, blunt, coarsely and unequally toothed except towards the base; the upper lobe the largest and trifid, the lateral lobes somewhat bifid. Flowerstalks bearing a few-flowered umbel, or sometimes only two or one flower; sepals short-pointed; petals small, blue; fertile filaments glabrous, much dilated towards the base, toothless, considerably longer

than the pointless sterile stamens ; pistil silky ; fruitlets hispid ; seeds brown-red ; cotyledons lobeless.

More frequently than this will be found an introduced British species, Erodium cicutarium, which has the segments of its leaves arranged in a pinnate form and deeply cleft, while its petals are pink or purplish.

To a distinct tribe of Geraniaceæ or a closely allied order (Oxalideæ) belong the *Sorrel-clovers* of the genus Oxalis, so called on account of their acidity from binoxalate of potash. *Oxalis corniculata,* the hornfruited Sorrel-clover, is as common here as in many other parts of the globe and always yellow-flowered, whereas our white-flowered Oxalis Magellanica is here like in Tasmania, New Zealand and South America confined to cool springy higher forest-regions.

The Native Flax (Linum marginale) belongs also to an order of plants, closely allied to Geraniaceæ, namely Lineæ.

Fig. XXXV.

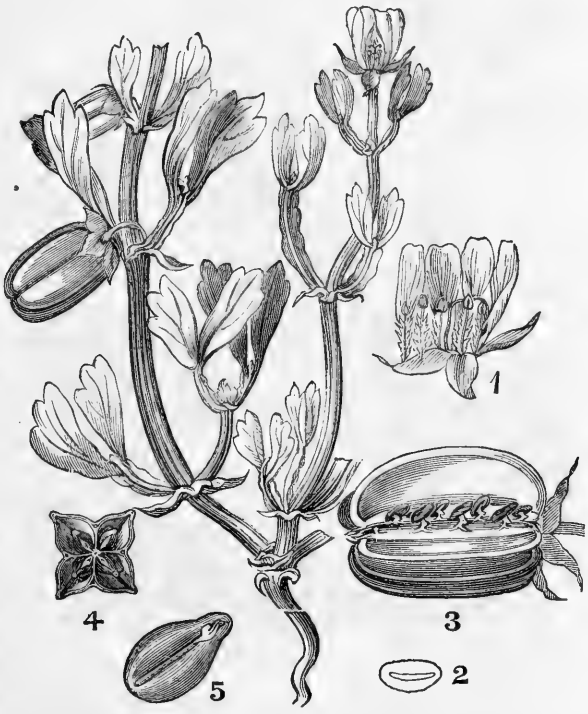


Fig. XXXV.—(Zygophyllum crenatum).—1, a flower laid open ; 2, pollen-grain ; 3, fruit, burst open ; 4, transverse section of fruit ; 5, a seed.

The Australian Flax, unlike the annual Flaxplant of culture, is a perennial species, not to be found beyond Australia, and replaced in New Zealand by the often white-flowered Linum monogynum.

The order of Zygophylleæ mediates a transit from Geraniaceæ to Rutaceæ. It is beyond the scope of this elementary book, to enter into details respecting the exact relations of these plants, and information on this subject can be found in the volume on "The Plants of Victoria" or the first volume of the Flora Australiensis. As illustrative however the drawings of a Zygophyllum and a Nitraria are given; the first of these derives its genus-name from the Greek language in allusion to its single pair of leaflets; Nitraria is to signify by its name, that it is pervaded by saline particles, though these consist not mainly of nitrates but chiefly chlorids. *Zygophyllum*

FIG. XXXVI.

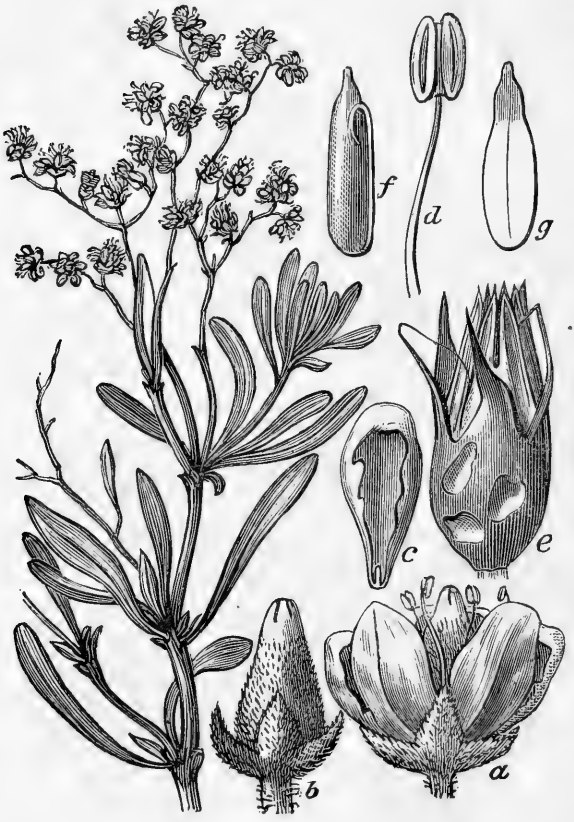


FIG. XXXVI.—(Nitraria Schoberi).—*a*, side-view of a flower; *b*, flower after the lapse of petals and stamens; *c*, a petal; *d*, a stamen; *e*, fruit deprived of its succulent covering, some of the valves forced back; *f*, a seed; *g*, longitudinal section of a seed.

crenatum (Fig. XXXV.).—We possess several species of this genus in Victoria, one of them not uncommon on coast-cliffs, the rest is confined to the desert-tracts. All our Zygophyllums are yellow-flowered.

Nitraria Schoberi (Fig. XXXVI.).—Our Nitraria is supposed to be identical with one occurring in the saline desert-tracts of South Europe and some parts of Asia and Africa. The yellow or purple fruits, though of a somewhat salty taste, are a favorite food of the original nomadic natives of Australia. An allied Nitraria represents at least in part the Lotus-bush of the ancients, so far as Arabia is concerned, where it is called Damouch, and famed for its small plumlike fruits.

XIII.—THE MALLOW

AND ALLIED PLANTS.

No genuine Mallow is a native of Australia, but several species of Malva have become naturalized, among which the British annual Dwarf Mallow (Malva rotundifolia) has found its way widest through our colony. The nearest of our indigenous plants to the real Mallows is the *Lavatera plebeja* or native *Marsh-Mallow.* As far as the genus is concerned it differs merely from Malva in the involucre of each flower, which is not cleft quite to the base ; moreover the axis, around which the fruitlets are arranged, exceeds them in length. From the genus of plants, to which the British Marsh Mallow belongs, namely Althæa, ours is easily distinguished again by the involucre, generally cleft into lesser lobes, also by the protruding fruit-axis. The leaves of our plant can be used for emollient poultices, just like those of the English Marsh-Mallow, and also the roots of ours form a fair substitute for the officinal Althæa-root. Chinese Hollyhock (Althæa rosea) so frequent in gardens, so brilliant for its varied dazzling floral colors and so remarkable for the quickness of its

growth, affords an easy opportunity for discerning the characteristics of the genus Althæa. The genus received its name already from Theophrastus in allusion to its medicinal use. Lavatera was dedicated to two Swiss philosophers of the last century.

Along many, particularly the southern rivers of Victoria, a tall shrubby malvaceous plant, with racemes of white flowers, the *Plagianthus pulchellus*, is very conspicuous. It is one of several or many plants, named "Currijong" by the natives, on account of the textile bast, worked by them into cordage and nets. The plants of this genus are noteworthy for the unisexuality of most of their flowers, staminate and pistillate blossoms being mostly produced on distinct plants. This is the main difference between Plagianthus and Sida, unless the position of the stigmas is also taken into consideration, lateral in the former, terminal in the latter genus.

Fig. XXXVII.

Fig. XXXVII.—(Howittia trilocularis).—1, side-view of half the flower; 2, pollen-grains; 3, fruit laid open; 4, starry hair.

Plagianthus received its name from the obliquity of its petals.

The Sidas are children of warmer latitudes; hence they are foreign to Britain, and so also they do neither reach the southern portions of our colony, although a few are dispersed towards the Murray-River. From Sida again is divided a subgenus, Abutilon, simply because the fruitlets of a legitimate Sida contain only one ovule each, while more than one, even many, are characteristic for Abutilon. The name of the latter is of Arabic origin, alluding to the few species with yellow flowers growing at and near the Mediterranean Sea, one of which, Linné's Sida Abutilon, being precisely the same as an annual plant not uncommon around the Murray-lagoons, springing chiefly up in the summer when the water recedes. The name Sida occurred already in ancient Greek, but was there applied to the white Water-lily of Europe.

To illustrate the Malvaceæ by

Fig. XXXVIII.

Fig. XXXVIII.—(Lasiopetalum Behrii).—1, flower seen from above; 2, fruit surrounded by the calyx and opened into its valves.

some artistic delineations the singular *Howittia trilocularis* (Fig. XXXVII.) is chosen, one of our rarest plants, dedicated to Dr. Godfrey Howitt of Melbourne, the writer of a list of plants of Nottingham many years ago.

Howittia could be included in Abutilon, were it not that the fruit is three-celled (not five- or more-celled) and that the

FIG. XXXIX.

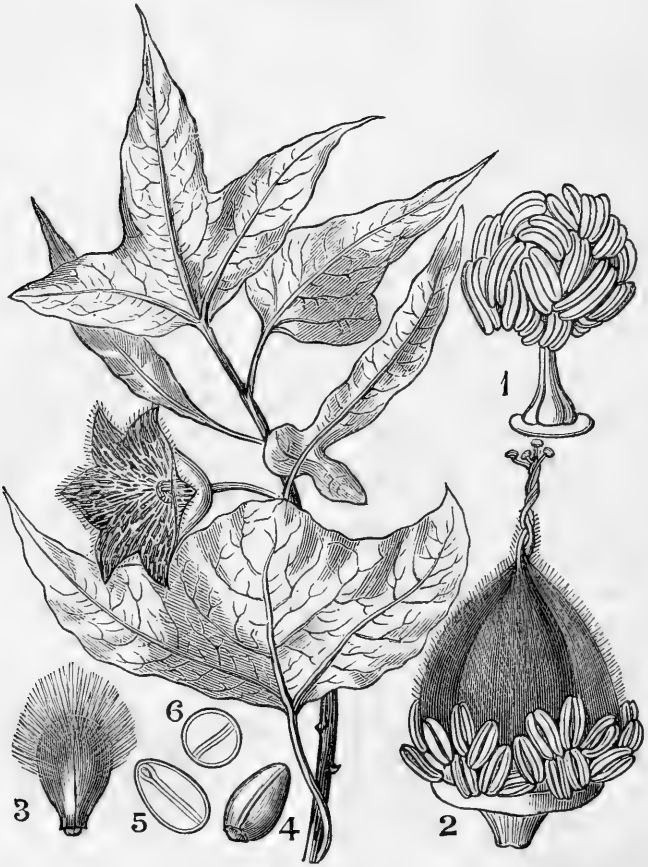


FIG. XXXIX.—(Brachychiton populneum).—1, cluster of stamens; 2, pistils surrounded by stamens; 3, a seed with its hairy cover; 4, a seed deprived of the cover; 5, longitudinal section of a seed; 6, transverse section of a seed; 1 and 2 considerably magnified, 3-6 natural size.

dehiscence of the latter is valvular like in Gassypium (the cotton-plant, which is co-ordinal, and produces also often three-valved fruits), and like in Hibiscus (of which garden plants for study can almost anywhere be obtained). Howittia is to be met on bushy irrigated declivities in the Grampians and Gippsland. Two other orders of plants are so closely allied to Malvaceæ, that they should not be passed unmentioned; the *Sterculiaceæ*, differing in two-celled anthers, and the *Tiliaceæ*, separable for the same reasons and besides on account of free (not connate) stamens. Of the few Victorian representatives of Sterculiaceæ *Lasiopetalum Behrii* is selected for illustration (Fig. XXXVIII.), a bush from the Murray-desert, named in honor of Dr. Hermann Behr, its discoverer, who is now engaged entymologically in California. The name of the genus is not well chosen, as it would imply hairy petals, whereas the minute petals are smooth, but the large calyx is beset with usually starry hairs. To this order belongs also our *Bottle-tree* (Brachychiton populneum) of the eastern frontiers (Fig. XXXIX.) Like the Plagianthus it passes also under the aboriginal name "Currijong;" it is an evergreen stout-stemmed tree, with foliage not unlike that of some Poplars; hence the specific name, while the generic appellation is derived from the short hairy coating of the seeds. The tree yields a kind of Gum Tragacanth. Among Tiliaceæ we count within the limits of our colony two stately trees of the genus *Elæocarpus* in East Gippsland, the fruits of which are not dissimilar to Olives, a circumstance which suggested the name. The type of the order is the British Linden-tree (Tilia Europæa).

XIV.—THE BUTTERCUPS, CLEMATIS AND ALLIED SPECIES.

Among the orders of plants with free petals inserted below the pistils, a few are notable for having their fruit separated into distinct fruitlets, each of which provided with a separate stigma (and often also style). Amidst these ordinal groups five interest

us as Victorian : Ranunculaceæ, Dilleniaceæ, Magnoliaceæ, Monimieæ and Menispermeæ, and illustrations of four of these are therefore offered. To the first of these belong the well known Ranuncles or Buttercups and also the Clematis or Virginsbowers. It is beyond the intentions of this first school-book, to sketch any of these plants descriptively ; and it must suffice, until larger works can be consulted with advantage, to direct the attention of the young student merely to such plants as the Buttercups of the meadows, which can be readily gathered and compared with the adjoined illustration of a congeneric plant, *Ranunculus anemoneus*, of the glacier-regions of our alps, to contrast thus specific differences, and to learn by these comparisons impressively the few scientific terms for the principal organs of such plants. Strictly the vernacular name applies only to a very few British Ranuncles with yellow flowers, and nothing but their color seems to justify the name ; while many of the Ranuncles, the one here illustrated also included, have white petals. An equally

Fig. XL.

Fig. XL.—(Ranunculus anemoneus).—1, a sepal; 2, a petal ; 3, front- and back-view of an anther ; 4, fruit-axis with a portion of the fruitlets ; 5, a separate fruitlet ; 1, 2 and 4 natural size ; 3 and 5 much magnified.

unmeaning name is applied, that of Crowfoots, to species with dissected leaves. Rational teaching should discourage these superfluous appellations, which are vague, carry not beyond one language and are almost useless burdens to the memory. If the well known name Ranunculus needs interpretation at all, then the literal translation into "Frog-plant" would be the best, particularly as many of the species frequent moist meadows near the swampy habitations of the frogs.

The species most common of all on our grass-lands, both on hills and plains, is *Ranunculus lappaceus*, so called, because the little fruitlets secede readily when ripe, and cling with their hooked style to clothing just like the bracts of the flower-heads of a Burdock (Arctium Lappa). On moist depressions particularly of the Murray-regions and on our western rivers may be sought for the little *Mousetail-plant*, a curious annual with insignificant flowers, narrow radical leaves and a stalked fruit-spike, which so precisely resembles a mousetail, as to have given also in science the plant its generic name, Myosurus, the species, one widely scattered in both hemispheres, bearing the name M. minimus. However unlike in external appearance, the Mousetail-plant approaches the Ranuncles in affinity very closely indeed. The differences of Myosurus consist in sepals extended downward beyond the point of insertion, in a more tubular base of the petals, in the elongated axis of the fruit and in a pendent (not erect) seed of each fruitlet. This instance demonstrates, that internal structure far more rules the affinity of plants, than external similarity.

In systematic sequence the lovely Clematis-climbers must next engage our attention. They obtained their name from the tendril-like twisting of their branchlets and particularly leaf-stalks. They are remarkable in the vast order of ranunculaceous plants for their mostly climbing growth and always opposite leaves ; these habitual distinctions are augmented by petal-like sepals contiguous at the margin before expansion, absence of or diminute petals and often a very elongated fruit-style.

Of the two kinds of Clematis, which belong to our colony, one frequents particularly the sea-coast, *Clematis microphylla* (the

small leaved Virginbower), where it adorns often the cliffs and bushy declivities, when early in spring it produces copiously its creamcolored flowers, and when later in the season it is beset with its feathery fruitlets. This species occurs however also inland, especially along river-banks and in desert-country. Our second species, namely *Clematis aristata*, is restricted to moist forest-regions, where it forms splendid festoons, and is one of the most beautiful objects to behold, when loaded with its large white flowers amidst the dark-green shining foliage. Botanically these two plants are distinguishable irrespective of some other notes by

Fig. XLI.

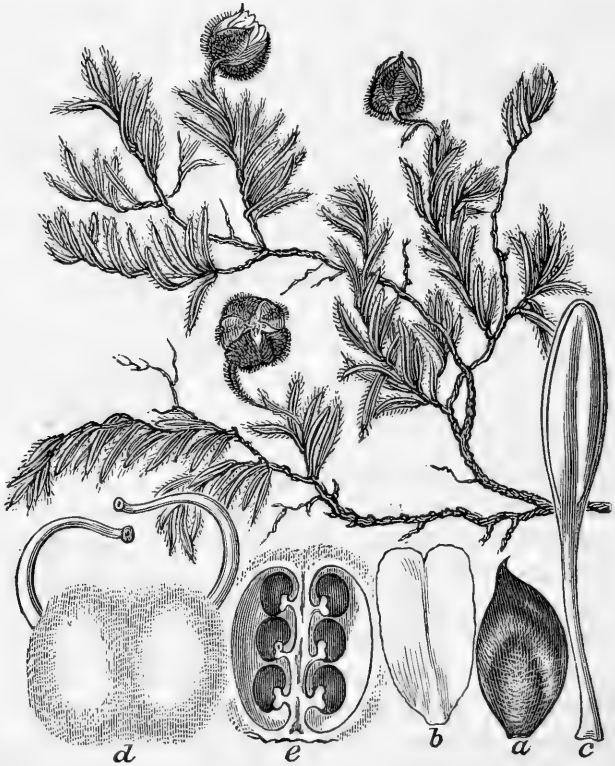


Fig. XLI.—(Hibbertia humifusa).—*a*, a sepal; *b*, a petal; *c*, a stamen; *d*, pistils; *e*, longitudinal section of an ovary, all much enlarged.

their anthers, small oval and without appendage in C. microphylla, elongated and by a very narrow appendage terminated in C. aristata, from which peculiarity it traces its specific name. The staminate and pistillate flowers of both species are usually developed on distinct individual plants. Nearly allied to Ranunculaceæ is a Waterlily, *Cabomba peltata* (or Brasenia peltata) of our north-eastern waters, singular for the dense mucilage, which invests all the submersed portions of the plant; it is remarkable also for its oval leaves being fixed at the centre to the leafstalk; this explains the species-name, whereas Cabomba is a vernacular name for similar plants in Guiana.

Dilleniaceæ play a rather important part anywhere in the Australian vegetation. Eight plants of this order are to be met within Victoria, all referable to the genus Hibbertia, which was dedicated to the Superintendent of the Botanic Garden of Clapham at the commencement of this century. The illustration of one congener, *Hibbertia humifusa*, must suffice to give an idea of these kinds of plants (Fig. XLI.).

Dilleniaceæ differ merely from Ranunculaceæ in having the seeds usually provided with an appendage (aril), but even the leading Asiatic genus Dillenia dedicated by Linné to the Director of the Botanic Garden of Oxford at his time, is devoid of the aril. Another distinction between the two orders, whether herbaceous or shrubby in growth, is not without exceptions, as some Dilleniaceæ are almost herbaceous, while even our own species of Clematis are quite woody.

Better marked are the two other orders of this series. The arrangement of sepals and petals of *Menispermeæ* is mostly ternary, the latter are usually minute and opposite to the stamens; ovaries usually three; seed frequently curved. These kinds of plants are nearly always woody climbers with unisexual inconspicuous flowers, and with fruitlets succulent outside, hard inside, with a protuberance intruding into the cavity. Our *Sarcopetalum Harveyanum* (Fig. XLII.), from East Gippsland, is almost anomalous among co-ordinal plants by its succulent petals, which much exceed the length of the calyx; their fleshy consistence suggested the name of the genus, while the species

was dedicated to the great author on Algæ, when he visited Australia, now nearly one quarter of a century ago. Only one other plant of this order occurs in our colony. Menispermeæ are called so from the crescent-shaped inner part of the fruitlets.

Fig. XLII.

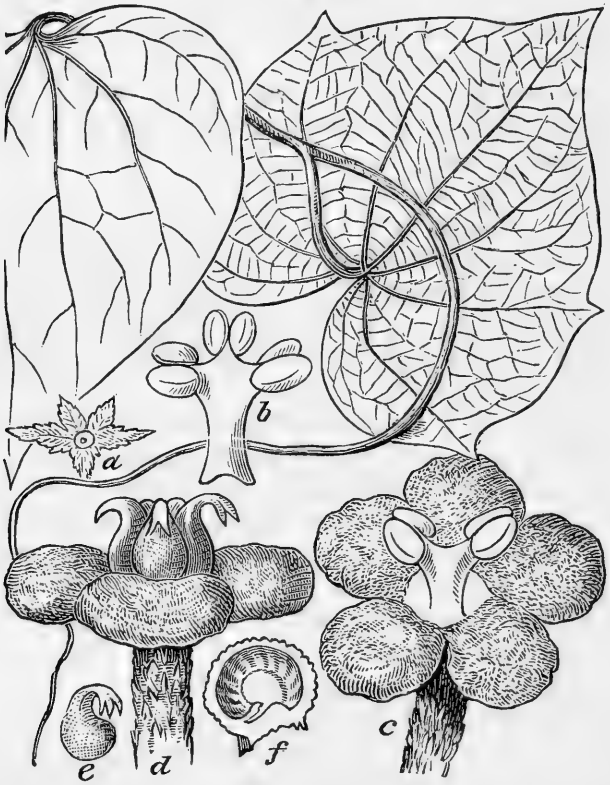


Fig. XLII.—(Sarcopetalum Harveyanum).—*a*, a calyx; *b*, stamens; *c*, a staminate flower; *d*, a pistillate flower; *e*, a pistil; *f*, a fruitlet: *a–d* much magnified; *e–f* slightly enlarged.

The *Monimieæ* are brought conspicuously before us by our *Sassafras* and native Mulberry-tree. The first of these, Atherosperma moschatum, obtained its generic apellation from the clematislike style terminating the fruitlets; its specific name

alludes to the aromatic properties of bark and leaves ; thus also arose the vernacular name in comparison to the Sassafras-tree of North America, the name itself changed from the Spanish Salsafras, applied to Saxifraga-herbs. Like the Sassafras so also our so-called *Mulberry-tree*, Hedycarya Cunninghami (Fig. XLIII.), is an inhabitant of deep irrigated forest-glens, where Fern-trees abound ; the flowers of both trees are unisexual. While the anthers of the Sassafras are opening by ascendent valves, like those of all laurinaceous plants, those of Hedycarya are bursting by longitudinal slits in the usual manner of most plants. Although the fruits bear some resemblance to Mulberries, they might almost as well be compared to Raspberries ; but they are not like either in taste, indeed not edible, nor akin in internal structure of the fruitlets composing

Fig. XLIII.

Fig. XLIII.—(Hedycarya Cunninghami).—1, an anther ; 2, a pollen-grain ; 3, a fruitlet ; 4, longitudinal section of a fruitlet ; 5, a seed.

them. This again demonstrates the indesirability of applying well understood and clearly defined appellations to very different objects of but faint similarity, and for which science has established well affirmed names. The etymologic meaning of the word Hedycarya has its origin from a New Zealand species with fruits of a sweetish taste. The petals are always absent in Monimieæ, staminate and pistillate flowers mostly distinct and the leaves opposite.

The order of *Magnoliaceæ* is represented here by a solitary member, the *Pepper-tree* of the colonists (Drimys aromatica). This order differs from Menispermeæ in usually bisexual flowers, indefinite numbers of stamens, the minute embryo and by more or less collective other details, which it is needless for the present purposes to explain. The Drimys is never found away from springy shady valleys, hardly ever ventures out of the densest forest, unless adscending the alps beyond the tree-zone, when dwarfed to a small bush, but finding sufficient humidity of the air to prosper in open localities. Indeed most species of Drimys seek a cool or even cold clime, although the genus is not represented in Europe. The Greek name was given in allusion to the pungent acridity of these plants.

XV.—THE SUNDEWS

AND ALLIED PLANTS.

The Droseraceæ, always glittering in dew, as the name implies, are dispersed through all altitudes up to eternal snow, and through all latitudes from the polar to the equinoctial regions. The attention of a playful child is attracted to these peculiar plants as well as the observation of the physiologist, who studies their dewlike secretions, or their power of assimilation, or the irritability of their glandular hair, or the mobility of their leaves for catching insects; while again the acrid-poisonous sap of these plants

renders them for the pastoral occupant obnoxious to his herds and flocks, whenever and wherever these plants grow gregariously. We here are interested only in one genus of this order or family, Drosera itself, which presents us with not less than ten species within the boundaries of our territory. One of the most frequent of these is the species, of which an illustration is offered, *Drosera Whitackeri* (Fig. XLIV.). It is one of the harbingers of spring, when it pushes forth on our meadows its rosette of leaves and its large white but soon evanescent flowers. Curiously enough, this Drosera, unlike most others of ours, does not cross over to Tasmania, and hardly passes into New South Wales, although it is equally frequent in South Australia. Equally common are here two caulescent species, *Drosera peltata* and *Drosera auriculata*. They are easily recognised by their almost crescent-shaped leaves, fixed towards the centre, and differ from each other in this: D. peltata has the sepals closely appressed and often hairy, and produces oval seeds; contrarily D. auriculata has the sepals laxly appressed and always smooth, and produces

Fig. XLIV.

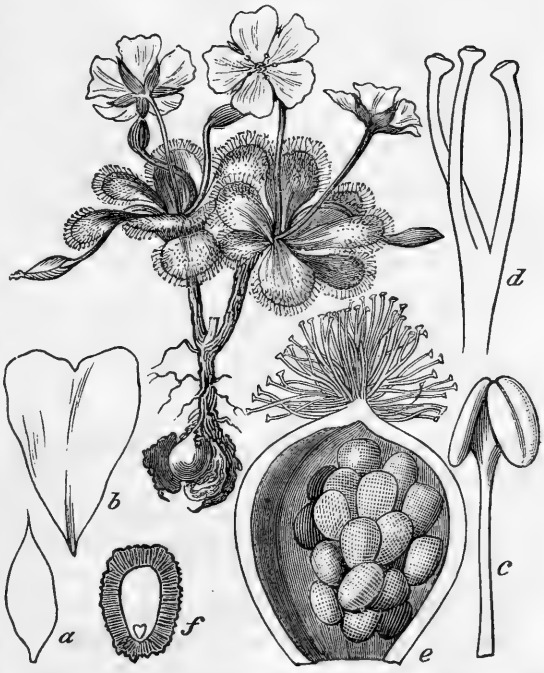


Fig. XLIV.—(Drosera Whitackeri).—*a*, sepal; *b*, a petal; *c*, a stamen; *d*, styles; *e*, longitudinal section of fruit; *f*, longitudinal section of a seed; all except *a* and *b* largely magnified.

awlshaped-cylindric seeds. Not unfrequent also is *Drosera Menziesii*, the beautiful tall almost climbing species with orbicular leaves centrally attached to their stalk ; it bears the name of the naturalist, who accompanied Vancouver's Expedition, and who gathered this very species, when during that voyage King George's Sound was discovered in 1791. Equally grand among its congeners is *Drosera binata* of springy morasses ; its leaves are cleft into long narrow lobes, which characteristic alone suffices to recognise this species. Minute, mosslike, with four-cleft flowers and fruits is *Drosera pygmæa* of our moory heaths ; while by its crimson petals the neat little *Drosera granduligera* is distinguished from all other sorts. The other species are rarer, one of which, *Drosera Arcturi*, is exclusively confined to alpine springy ground, where snow lies for some months in the year. The four first-mentioned Droseras have tuberous roots, which contain a red pigment, and a purplish color pervades the whole plants, thus staining paper during the process of drying.

Among the orders of plants with free petals and with fruits free from the calyx (not enclosed in its tube), the Droseraceæ pertain to a series, all of which bear the seeds on placentas, attached to the fruit-valves, therefore not attached to any central axis.

The Violet-order or *Violaceæ* belongs also to this series. One main characteristic mark of this family consists in the filaments being extended into a membrane beyond the anthers. Our little trailing native Violet, *Viola hederacea*, with its more or less roundish or renate or rhombeshaped leaves is a plant familiar to all ; it is somewhat aberrant from nearly all other Violets by the lower petal not being protracted downward into a gibbosity (pouch or so-called spur). Less frequent is *Viola betonicifolia*, the betony-leaved Violet ; its leaves are longer than broad ; the stipules are adnate (not free as in V. hederacea), and the lower stamens have awlshaped appendages, which are wanting in its just mentioned congener. A white flowering Violet, *Viola Caleyana*, occurs at the bases of our Alps ; it bears the name of its discoverer, who first penetrated as a scientific traveller beyond the Blue Mountains. The plant, selected for illustrating the Violaceæ, Fig.

XLV., is *Hybanthus floribundus* (or Ionidium floribundum). Its genus did receive the name from the descending hollow protrusion of the lower petal, usual in Viola, from which it differs in having the sepals not or but slightly lengthened at the base beyond the point of insertion ; moreover Viola comprises mostly herbaceous, Hybanthus contrarily generally shrubby plants, but exceptions to this rule can even be observed in plants of this colony, two small species with blue flowers occurring in Gippsland (H. filiformis and H. Vernonii). The shrubby species, of which an illustration is given, grows in the Murray-desert, thence to the Pyrenees, where it was gathered already by their discoverer, Sir Thomas Mitchell.

In river valleys especially of the forest-tracts we meet not rarely a very tall shrub with spinescent branchlets, oblong-linear or somewhat wedgeshaped leaves, solitary small fragrant flowers on decurved short stalklets bearing yellow petals and with small globular or oval berries. However unlike in external appearance, this is a member of the order of Violaceæ, namely *Hymenanthera Banksii*,

Fig. XLV.

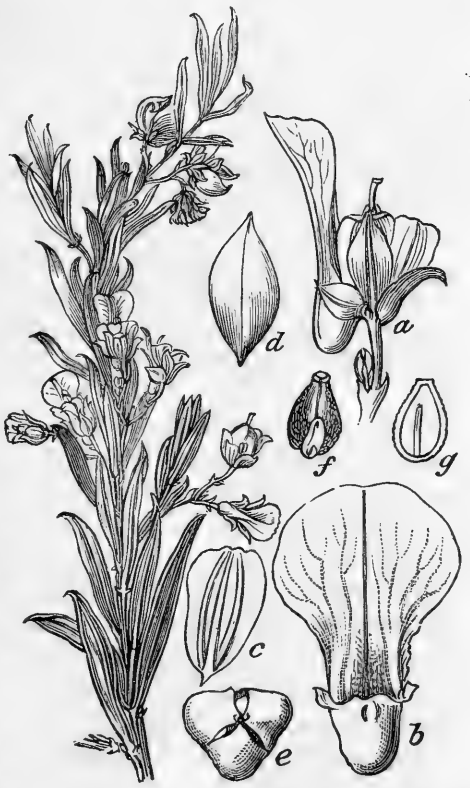


Fig. XLV. — (Hybanthus floribundus). — *a*, flower ; *b*, lowest petal ; *c*, one of the upper petals ; *d*, a sepal ; *e*, fruit seen from above ; *f*, seed ; *g*, longitudinal section of seed ; all magnified.

it possessing most of the essential floral characters of that order, as obvious already from the Greek name (literally translated : membrane-anther) in reference to one primary note. The petals are however all equal, the fruit is not dehiscent into three valves, and contains only one to four seeds. This bush bears the name of Sir Joseph Banks, its discoverer, who with Dr. Solander as companions of Cook shed the first light on the vegetation of East Australia. Still more important here than Violaceæ in the same series of orders are the *Pittosporeæ*. Many plants of the typical genus Pittosporum are well known here as indigenous or (particularly New Zealand species) as cultivated. Colonists have found no difficulty to convey to memory the name, meaning Pitch-seed (because the seeds are surrounded by viscidity), and thus fortunately at least this beautiful genus has escaped from losing in vernacular language that name, by which it is known through many countries of the eastern hemisphere as indigenous and almost anywhere in gardens or plant-conservatories. Of the three native Victorian one, *Pittosporum phillyroides*, with weeping branches, narrow glabrous leaves and bony yellowish compressed fruits, belongs to the desert-tracts. Species name from some resemblance to the spurious Olive-bush from near the Mediterranean Sea (Phillyrea). *Pittosporum undulatum* occurs here from Westernport to Gippsland. It is the beautiful bush much cultivated, with broad waved leaves, unequally connate sepals and very fragrant white flowers. *Pittosporum bicolor* is an inhabitant of the Ferntree-gullies, where it may rise to a moderate sized tree ; its leaves are silky- or velvet-downy beneath, and the often purple and yellow petals gave rise to its specific name. A common bush of this order is *Bursaria spinosa*, so called from the purse- or pouch-like form of the small two-celled fruit, which not becomes woody, and splits only at the summit. It differs from the Pittosporums already in having only 1–3 flat seeds in each division of the fruit, and these seeds placed vertically. Its small white flowers are collected into panicles.

As a representative for ordinal illustration is chosen an elegant climber, *Marianthus bignoniaceus* (Fig. XLVI.), from the Gram-

pians. The drawing explains the form and disposition of its leaves, flowers, fruits, and seeds. Its corolla is prettily orange-yellow. Marianthus was named by Baron von Huegel in honor of the Princess Marie von Metternich, who for many years patronized horticulture in the Austrian Metropolis. This genus gives a good idea also of that of Billardiera, with which it accords, except that the fruit is capsular (dehiscent) not baccate. Our Billardieras are lasting monuments to the memory of the Naturalist of D'Entrecasteaux's Expedition. *Billardiera longiflora* has the petals bending together into an almost cylindric corolla, the style very elongated, and the usually blue berry one-celled, hollow and destitute of mucilaginous pulp. It is never seen out of forests, where it delights in damp ravines. *Billardiera scandens* is much commoner ; its petals bend together into an almost bellshaped corolla ; its style is very short, and the completely two - celled berry is livid and filled with soft pulp. From this *Billardiera cymosa*, mainly of the desert tracts is chiefly distinguishable by bearing the flowers not solitary but united into cymes or panicles.

FIG. XLVI.

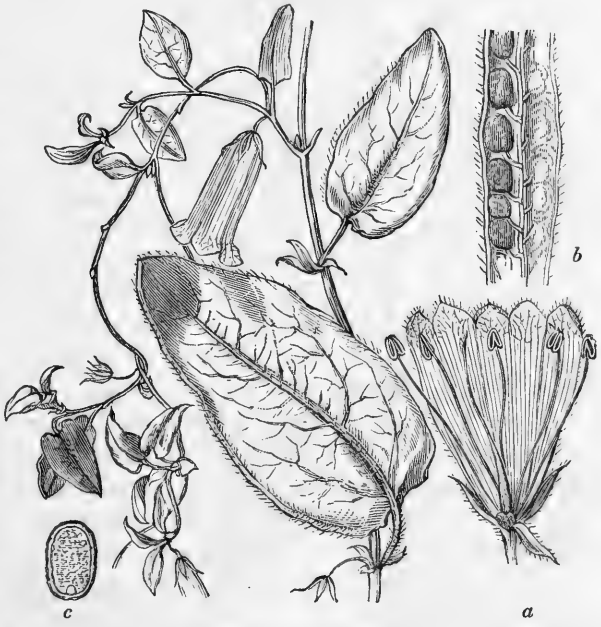


FIG. XLVI. — (Marianthus bignoniaceus).—*a*, a flower laid open ; *b*, portion of a fruit, opened ; *c*, a seed cut longitudinally ; all somewhat magnified.

XVI.—THE CRUCIFEROUS PLANTS AND THEIR ALLIES.

We pass from the series of plants last considered readily to another group of orders, which shows division of the flowers almost constantly quaternary, not as in the majority of dicotyledonous plants quinary; the placentation of the seeds is likewise not axillary, but more in accordance with that of the Violaceæ, Sundews and Pittosporaceæ. It is the great order of Cruciferæ, which prominently claims here our attention. The name is well devised, inasmuch as over a thousand cruciferous plants hitherto known have with rare exceptions their four petals placed in such a manner, as to exhibit the form of a cross. Cabbage, Mustard, Cresses, Wallflowers, Stock, Turnips and Radish are well known examples of this class of plants. They are comparatively largely represented in our colony, although they are almost absent in the vast expanse of intratropic Australia. Irrespective of several immigrated weeds we count in this colony thirty-two truly indigenous Cruciferæ. One of these is illustrated, *Erysimum lasiocarpum*, Fig. XLVII., to serve as a guidance to the recognition of such kinds of plants.

Fig. XLVII.

Fig. XLVII.—(Erysimum lasiocarpum).—*a*, complete flower; *b*, stamens and pistil; all magnified; *c*, fruit, natural size.

It is unnecessary to adduce any descriptive details, as such can be found in special works; but it is desirable to give an outline of the general characteristics, by which any cruciferous plant can be recognised and thus be placed into its proper ordinal position.

Cruciferæ: Sepals free, always four, in somewhat unequal pairs, mostly with their margins overlapping in bud; the outer pair opposite to the placentas; the inner pair usually more protracted at the base. Petals four, rarely two or none, deciduous. Stamens six, rarely fewer, only in one known instance numerous. Anther-cells slit along the inner face. Stigmas two, generally confluent. Fruit often deciduously two-valved, and longitudinally two-celled. Seeds fixed to the intervalvular narrow placentas. Albumen none or very rarely present. Embryo oily, variously curved, hardly ever straight; radicle very often adscendent. Herbaceous or not frequently half-woody plants, of volatile acridity and limpid sap. Leaves mostly scattered, at the root often crowded. Flowers with rare exceptions in racemes. Stipules and bracteoles none.

Erysimum received its generic name from its resemblance to Sisymbrium, to which Theophrastos applied already that appellation before the Christian era, and of which three species also occur in Victorian territory, particularly in the North-western desert-regions, where the majority of our Cruciferæ are to be found. E. lasiocarpum was specifically so named on account of its hairy fruits. From the Wimmera to the Murray-River may be met sparsely in early spring a small stemless annual herb, with deeply lobed leaves and with fruits crowded at the roots; this is the *Geococcus pusillus*, remarkable as the name implies for usually burying its fruit during the maturation-process in the sand, into which many of it fully descend. This and a Vigna lanceolata (a bean-bearing plant of Queensland) furnish the only instances among Australian plants of this curious economy of growth, of which however the well known Arachis hypogæa, (the pea-nut or ground-nut of Brazil) gives a familiar example. Our common *Wild Cress* (Lepidium ruderale) is identical with that of the northern hemisphere. So also the *Sea-Rocket* (Cakile maritima) and the ordinary *yellow-flowered Watercress* (Nasturtium terrestre) do not differ

from the plants of Britain and many other countries. Cakile must be sought near highwater-mark on sand-coasts, where it is the only cruciferous plant, able to exist under such circumstances. It is very conspicuous with its succulent leaves and comparatively large purplish flowers; it is also very remarkable among plants of its order in its fruits, consisting of two parts, separated by transverse articulation, both one-celled and indehiscent, the lower joint gradually dilated upwards with a pendent seed; the upper joint attenuated towards the apex with an erect seed. The name Cakile occurred first in the writings of the ancient Arabic Physician Serapion, and seems to signify the use of this plant as an application to tumors. The appellation Nasturtium for Watercresses emanates already from the writings of Plinius, changed from Nasitortium, on account of the pungency of a cress-like plant, to which it was first applied. Lepidium received its name also from the same ancient naturalist in allusion to its scale-shaped fruits.

At the very outset of examining a cruciferous plant, the position of the radicle towards the cotyledons must be ascertained, and also at once must be enquired, whether the cotyledons are straight or folded, as on these criterions the distribution of the numerous genera into tribes largely depends. When the seeds are very minute, the dissection is facilicated, as also in many other subtle analyses, by mollifying them in boiling water. It will then more easily be seen, after removal of the outer seed-pellicle, whether the edges of the cotyledons are turned to the (accumbent) radicle, or whether the latter (incumbent) faces the sides of the cotyledons; or in other words whether the position of the radicle towards the cotyledons is marginal or dorsal; the presence or absence of flexures of the cotyledons becomes also best apparent in soaked seeds. In this manner is also easily observed, that the embryo (cotyledons and radicle) is not surrounded by any albuminous separate mass in seeds of cruciferous plants, unless in very rare instances.

To the series of orders, which contains the Cruciferæ, belong also Papaveraceæ and Capparideæ, each of which represented only by a solitary genus and species in this colony.

The *native Poppy* (Papaver aculeatum) is an annual plant with milky sap ; the leaves are pinnatifid-jagged, as well as the stem flowerstalks and sepals armed with short rigid spreading bristlets ; lobes of the leaves short, comparatively broad, acutely toothed ; flowerbuds drooping ; sepals two or seldom three, deciduous ; petals scarlet or brick-colored, about twice as long as the brown-yellow numerous upwards capillary filaments, usually four or sometimes six, comparatively small, very fugacious ; anthers heartshaped-oval, yellowish, their dehiscence marginal ; teeth of the radiate-stigmatiferous disk 5–9, minute, semi-orbicular ; margin of the disk slightly waved, not folded ; fruit glabrous, truncate-ellipsoid, opening under the disk ; placentas extending from the walls of the fruit scarcely half way towards the centre of the cavity ; seeds brownish-black. This species seems confined to the sandy desert-country towards the Murray-River, so far as our colony is concerned ; it occurs however also in the surrounding colonies, and may possibly have come first to us from South-Africa.

Fig XLVIII.a.

The Opium-Poppy (Papaver somniferum) of the countries around the Mediterranean Sea, an inmate of many of our gardens, affords

an easy opportunity to examine the characteristics of this genus of plants still further.

Turning next to the cognate *Capparideæ*, we will find, that our only plant of this order is quite singular in the structure of its calyx, as the illustration Fig. XLVIII.A fully explains. Instead of four overlapping sepals, as is usual in the typical species of

FIG. XLVIII.B.

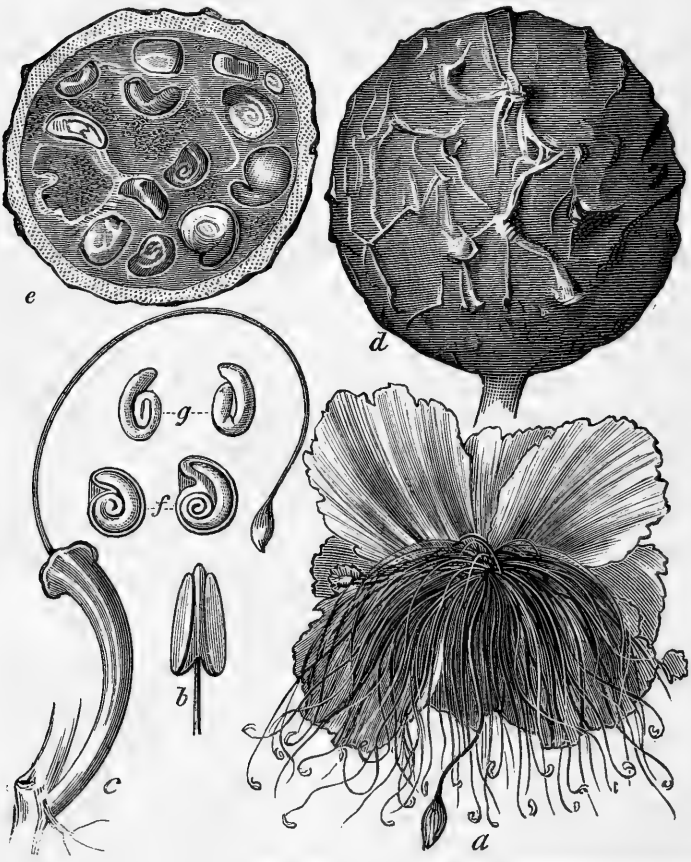


FIG. XLVIII.B.—(Capparis Mitchelli).—*a*, flower; *b*, stamen with a portion of the filament; *c*, flowerstalk and ovary with its stalklet; *d*, fruit; *e*, fruit cut transversely; *f*, longitudinal section of seeds; *g*, embryo; all except *b* natural size.

Capparis or Caper-plants, ours the *Capparis Mitchelli* (or Busbecquea Mitchelli) has the two outer sepals connate into a conic- or pyramidate-globular closed covering, which only gradually and irregularly bursts into two halves. The two inner sepals are petal-like ; thus the corolla appears to consist of six petals. The numerous free stamens, the long-stalked ovary, the berrylike large fruit and coiled embryo are formed on the model of the generality of the Caper-plants. These notes, supported by the illustration, may suffice for drawing attention to the Cappariдeæ, as perhaps not even this remarkable Busbecquea-tree any longer exists within Victorian boundaries, the only locality here of its growth, near the junction of the Murray-River and Murrumbidgee being so very much denuded of its original vegetation by pastoral occupation, under which many of our rarest plants gradually succumb and totally disappear.

Through the arid regions of Central Australia the Busbecquea-Caper of Sir Thomas Mitchell presents itself on many places, and has unfortunately received there the name of Native Orange-tree, though even the acrid pungent Caper-taste widely removes the fruit from any of orange-flavor. It should also in colonial language maintain the memory of the Belgian Nobleman A. G. de Busbecq, who as Ambassador of Charles V. in Turkey first rendered known many oriental plants.

XVII.—THE NIGHTSHADES
AND ALLIED PLANTS.

In many of the foregoing pages some of the affinities and characteristics of plants with free petals were briefly discussed. Among those bearing fruits not adnate to the calyx, we became acquainted with Rutaceæ, Zygophylleæ, Geraniaceæ, Malvaceæ, Sterculiaceæ, Tiliaceæ, Ranunculaceæ, Dilleniaceæ, Monimieæ, Menispermeæ, Droseraceæ, Violaceæ, Pittosporeæ, Cruciferæ,

Papaveraceæ and Capparideæ. Orders less important for early study were omitted. At the commencement of this little work Myrtaceæ came under consideration, and it was shown, that in the series of orders with free or separated petals (Choripetaleæ or less accurate Polypetaleæ), they occupied a place along with those, which have the fruit immersed into the adnate tube of the calyx. Had the limits, assigned to this first school-book, admitted of space, then umbelliferous plants, of which the Carrot and Parsnip are well known examples, could have been treated by choosing native plants for demonstration; the same may be said of Onagreæ, exemplified in gardens by Fuchsia, and of several other orders, which in primary respect to petals and fruits should be placed near Myrtaceæ, if a strictly systematic sequence was required.

Explanation passed on from Myrtaceæ to ordinal groups of widely distant affinity, because it was thought, that among native plants the young disciple would most easily obtain the needful instructive objects from easily recognised trees. Hence Casuarinæ and Coniferæ, both without any petals, came under review, and so the Leguminosæ. The latter form a transit from orders with free petals to orders with connate petals, if this characteristic is adopted as a primary one for classification. Leaving here out of consideration the Proteaceæ (some in fruit not unlike to Leguminosæ), the Santalaceæ and Loranthaceæ, the floral envelope of which may be considered either petaline or sepaline according to various views and interpretation of their floral structure, we advanced to orders with almost invariably and permanently connate petals (gamopetaleæ), or less logically called also monopetaleæ or synpetaleæ. Among these Compositæ (still containing arborescent species), Campanulaceæ, Stylideæ and Goodeniaceæ belong to the series with fruits connate with the calyx, whereas Epacrideæ pertain to that long series of families, in which the petals are united and the fruit remains free from the calyx. Before leaving the dicotyledonous plants and proceeding to Monocotyledoneæ, still two more orders of the series, to which the Epacrideæ pertain, are to be interposed, because the one contains here several poison-plants, with which

the young student should become early acquainted; while the other family or order furnishes several widely distributed and easily recognised plants, of which one or more would almost in any search-excursion come under view. What in deviation and recapitulation is now said before we proceed, will be made still clearer, if the wood engravings are on this occasion once more and connectedly consulted.

The well known British vernacular "Nightshade," has reference to plants of several genera, but all of one order, that of *Solanaceæ*. The deadly Nightshade of Europe and North Africa is Atropa Belladonna, yet a most important plant in medicine, when administered by an experienced physician. In its powerful action, to dilate the pupil of the eye, it is approached also by some Australian Solanaceæ of the genera Duboisia and Anthocercis, the latter so called from the five radiating segments of the corolla of some species, a few of which occur in Victoria. The ordinary *Annual Nightshade* (Solanum nigrum) now so common on waste-ground and often detrimental to pastoral animals, may not be strictly indigenous, as it has found its way gradually to most parts of the globe. The small black berries are poisonous; therefore children cannot be sufficiently warned to abstain from them, though at times the poison-principle (an alkaloid called Solanin) seems little or not developed. Indeed like in most or perhaps all Solanums the foliage is very poisonous, so also that of the Potato-plant (Solanum tuberosum), which is so powerfully narcotic as to prevent, even when placed around fruit-trees, the access of insects. Potato-berries contain also Solanin, and so those of Solanum aviculare, on which our colonists have very inappropriately bestowed the name *Kangaroo-Apple*, while in literal scientific translation it ought to be called Bird's Nightshade, because Captain Cook's companions observed in New Zealand, that birds were feeding on the berries of this bush. Illustrated at Fig. XLIX. is the allied Solanum vescum or *Gunyang* of the natives. The last-mentioned species differs from S. aviculare in usually green not dark-purplish branches, in sessile decurrent somewhat rough and less shining leaves, in more tender often less deeply cleft corollas seldom whitish

outside, in thinner styles and filaments, the latter not shorter than the anthers, in more acute teeth of the calyx and in almost spherical transparently green (not orange-colored and mostly eggshaped) berries with larger seeds.

Fig. XLIX.

Fig. XLIX.—(Solanum vescum).—Flowering and fruiting branchlet.

S. vescum, so called on account of its berries being used for food by the Aborigines, is not quite so tall and woody as S. aviculare; both may grow intermixed, but oftener one may occupy one tract of the country, while the other predominates in adjoining regions. These two afford a good opportunity to contrast specific differences. The similarity of both to each other forbids to recommend the fruit of the Gunyang as edible, although the Tomato (Solanum Lycopersicum) of South America, the Egg-

plant (Solanum melongena) of tropic Asia, and several other Nightshades (concerning which the writer's work on select plants eligible for culture and naturalization in Victoria may be consulted) together with the likewise solanaceous "Cape Gooseberry" (Physalis Peruviana) afford well known esculent fruits. Victoria possesses as a member of this order also a *Wild Tobacco* (Nicotiana suaveolens), with greenish-yellow flowers. The genus Nicotiana was dedicated to Jean Nicot, French Ambassador in Portugal, who more than 300 years ago introduced the smoking of tobacco into France. In contrast with Solanum it is chiefly characterised by a tubular corolla, by the capsular dehiscent fruit and the innumerable minute seeds, with a but slightly curved embryo. Solanum as a genus is one of the richest of the whole globe, the number of species being recently estimated by Bentham and

FIG. L.

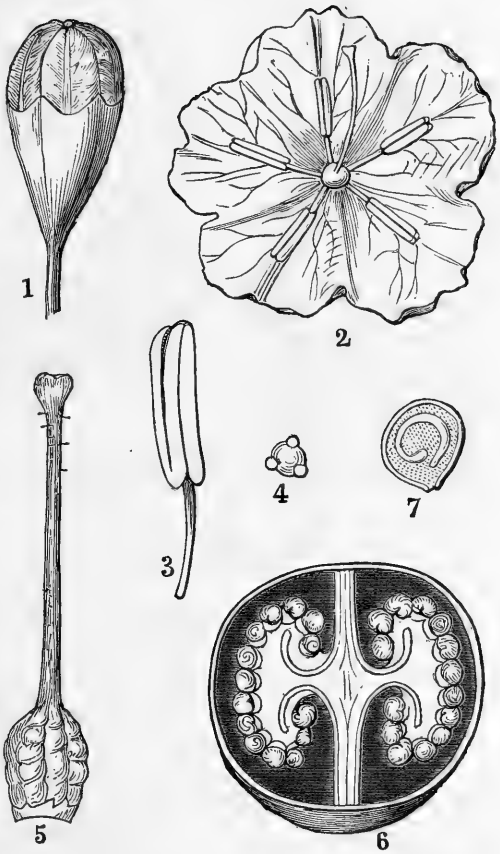


FIG. L.—(Solanum vescum).—1, flowerbud; 2, flower seen from above; 3, stamen, several times enlarged; 4, pollen-grain, 300 times diametrically magnified; 5, pistil, several times enlarged; 6, transverse section of berries, natural size; 7, seed enlarged and opened to show the embryo.

Hooker at about 700, many of them prickly. Only seven are known from Victoria, whereas half a hundred are dispersed through the tropical regions of Australia. Although Greek physicians made use of the Solanum nigrum under the appellation of Strychnos before our Christian time, yet its present name arose with Plinius and seems to have been derived from the Latin solamen, in allusion to the soothing medicinal properties of these plants. To the series of orders with symmetric flowers and with stamens usually equal in number to the lobes of the corolla and alternate with them, belong with Solanaceæ also *Convolvulaceæ*, distinguished already by the definite paucity and erect position of the seeds, with inferior radicle, usually folded cotyledons and little or no albumen. The cosmopolitan *Convolvulus sepium* of our valleys with its large white or pink flowers and the small *Convolvulus erubescens* of our pasture grounds may serve as readily attainable examples for the study of these kinds of plants.

XVIII.—THE MINTS

AND ALLIED PLANTS.

The order, to which the Mints and cognate plants are pertaining, is known phytographically as that of the *Labiatæ*, the name being bestowed by Bern. de Jussieu about the middle of the last century on this ordinal group of plants, because the irregularly shaped corolla forms towards the summit two unequal divisions, compared to lips, though both usually subdivided, the upper portion in two, the lower in three lobes. But this form of the corolla is not peculiar to Labiatæ; contrarily it is shared by several other orders of plants, of which may be mentioned as represented in Victoria: Scrophularinæ, Orobancheæ, Lentibularinæ, Bignoniaceæ, Gesneriaceæ, Myoporinæ and Verbenaceæ. Among these the last mentioned approaches structurally nearest to Labiatæ;

indeed no absolute limits exist between these two families, but usually the fruit of Labiatæ is divided into four fruitlets, between which the style is inserted, whereas in Verbenaceæ the fruit is usually not lobed, the style thus arising from the summit of the ovary or fruit. The leaves of Labiatæ are never alternate, mostly opposite, sometimes whorled. The stamens are less in number than the lobes of the corolla, consisting of one pair or more frequently of two unequal fertile pairs. The anthers are usually distinctly two-celled ; but the two cells may become confluent, or may in half of the stamens remain undeveloped or even be reduced to one cell in all anthers (in the exclusively Australian well named genus Hemiandra) ; each of the ovaries contains only one ovule, the seeds are without conspicuous albumen ; the radicle of the embryo is occupying a basal position. *Myoporinæ* in contrast have the leaves mostly scattered, the anthers always confluently one-celled, the fruits drupaceous and the radicle occupying a terminal position. *Asperifoliæ* (or Boragineæ) mediate a transit to Labiatæ ; but their corolla is as a rule regularly 5-lobed and bears five equal fertile stamens, while the radicle is terminal. The other orders, mentioned as bearing corollas of a form similar to that of Labiatæ, are all easily distinguished by the structure of their fruits, irrespective of the usually numerous seeds. The gay South American Verbena chamædrifolia may be gathered in any garden. Our common *Vervain* (Verbena officinalis), is identical with that of Europe. Our only *Mangrove-tree* (Avicennia officinalis), which may be seen on muddy inlets, washed by high tides, is also a verbenaceous plant, however externally dissimilar in appearance to other plants of this order, with which we may become acquainted in gardens. It bears the name of a Persian physician and Vezir, who wrote more than eight hundred years ago on medicinal plants.

The order of Labiatæ is a large one ; it contains over 2,000 species, distributed over all zones. The number of the truly indigenous Victorian coordinal plants is limited to thirty, but besides several European weeds of this family have found their way copiously to us. Prostanthera is the genus, most largely represented in our colony, nearly half of our Labiatæ being

referable to it. It was named in allusion to the appendicular processes of its anthers (see Fig. LI.), and is restricted to Australia. Perhaps the only instance of a plant of this order attaining to the size of a a real tree is given by *Prostanthera lasianthos*, which is not unfrequent in our forest-glens, and is specifically so called on account of its downy flowers. The only thorny species is *Prostanthera spinosa*, of which a figure as illustrative of genus and order is given.

Fig. LI.

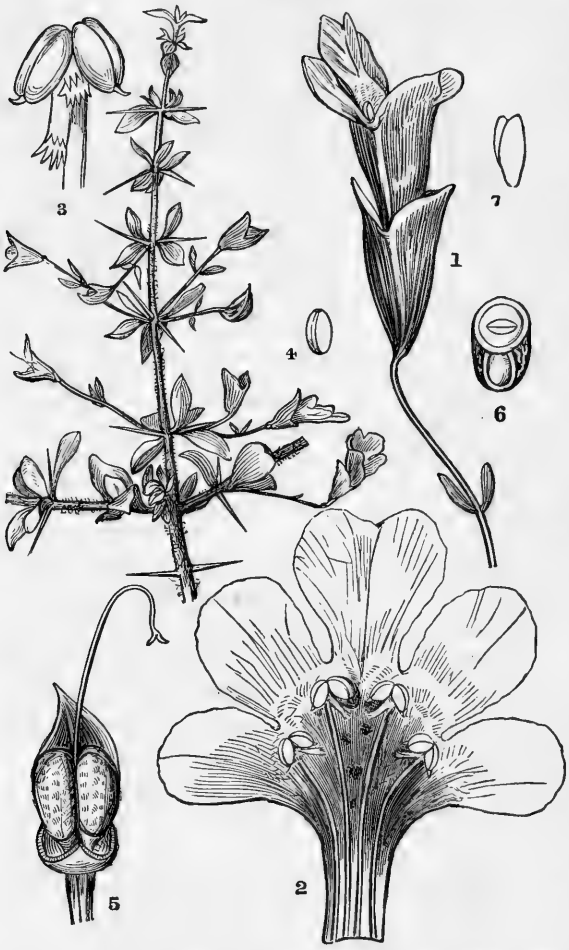


Fig. LI.—(Prostanthera spinosa).—1, flower with stalklet and bractlets, many times enlarged; 2, corolla much magnified, open to show the position of the stamens; 3, anthers much enlarged; 4, pollen-grain, 300 times diametrically magnified; 5, fruitlets, the calyx slit partly away, magnified; 6, a separate fruitlet, cut transversely, magnified; 7, embryo, magnified.

Prostanthera spinosa is wild on the Grampians, thence extending sparingly westward to Spencer's

Gulf. P. coccinea of the desert-country is the only red-flowered kind.

The *Mints* of Victoria comprise four specific forms, not in all instances easily separable, a remark which applies as well to many extra-australian Mints. Our *Forest-Mint* (Mentha laxiflora) is characterised already among the native Victorian species by its toothed leaves and by the considerable length of the stalklets of its flowers. Our *River-Mint* (Mentha australis) produces leaves almost teethless and lanceolar; the flowers are nearly sessile, and the teeth of the calyx very narrow. Between this and the small depressed M. saturejoides holds almost an intermediate place the pretty Mentha gracilis. An oil, similar to that of Peppermint, can be distilled from these herbs.

The order of Myoporinæ, to whose characteristics has already been alluded cursorily, should not be entirely passed on this occasion, as its numerous showy plants are real ornaments to the vegetation especially of our desert tracts. This applies particularly to the genus *Eremophila*, all the species of which are elegant shrubs, many now valued in select cultivation. *E. maculata* with red and spotted flowers is the best known of all, and curious for its almost S-shaped flower-stalks. No name of a genus could have been happier chosen than that of Eremophila, as all the species, more than half a hundred, are confined to desert-ground, all Australian only. The etymon of *Myoporum* is from the porous leaves, those of the first described M. lætum from New Zealand being dotted but not perforated by thousands of pellucid pores. The genus is particularly interesting as showing the transit from an almost symmetric five-lobed corolla to the variously modified bilabiate corolla of Eremophila, also in developing not only the four fertile stamens peculiar to its series of orders, but also in complete isometry sometimes five equal fertile stamens. *M. insulare* is a dwarf tree of saline-grounds with small purplish succulent fruits and carnulent-thick mostly lanceolar and somewhat denticulated leaves. M. platycarpum of the deserts, adjoining the Murray-River, exudes from its stem a saccharine secretion, of which the native tribes used to be very fond.

XIX.—THE ORCHIDS.

The order of orchideous plants is one of the most attractive as well to the scientific investigator as to the horticulturist. The magnificence of a multitude of its species, the facilty with which most of the epiphytal sorts admit of transit from their secluded natural haunts to wide distances, the grand or odd form of the flowers of many and their often gay or gorgeous colorations have rendered them prized beyond most other kinds of plants for the conservatories of the cultivator, the album or atlas of the painting artist and the drying books of the collector of native plants. In extratropic latitudes like ours nearly all Orchids are terrestrial and in still colder zones they are exclusively so, for even the glacier regions of Alps and polar countries are not quite without these lovely plants. Thus we possess only three epiphytal species in this colony, but not less than sixty well marked terrestrial Orchideæ. The ordinal name applies to the usually double tubers of these kinds of plants. The genera of Orchideæ are primarily distinguished by the consistence of their pollen-masses ; in ours they are waxy in Dendrobium, Sarcochilus and Dipodium, granular in Gastrodia, powdery in the numerous others of our genera. The two first-mentioned genera comprise the *epiphytal* plants indigenous to our colony ; these are so called, because they grow usually on the stems and branches of trees, and never on ordinary soil, although our two Dendrobiums, both from East Gippsland, are content to vegetate on mossy rocks. The name signifies that the plants of this genus live on trees. Our *Dendrobium speciosum* is a large showy plant, well known through conservatory-culture, hardy also in any shady and moist rockeries of our lowland.

Dendrobium striolatum is illustrated as a representative of the order, the main-criteria of which consist in the outer and inner row of sepals (or calyx-segments) being mostly unequal and petal-like, one of the inner sepals (except in Thelymitra) shaped very differently to the rest (called lip or labellum),

only one or rarely two stamens, these and the style united into an one-sided column, pollen-masses in one or more pairs, the one-celled ovary and fruit enclosed in and connate with the tube of the calyx, the fruit bursting into three valves and containing innumerable seeds, mostly very minute without albumen and fixed to the axis of the valves.

The delicate *Sarcochilus parviflorus* may be found on the branches of the Musktree in the Cape-Otway Ranges, the Dandenong-forests, on the Genoa and probably elsewhere in deep gullies, where Ferntrees luxuriate. The genus received its name from the thick (somewhat fleshy) consistence of the labellum. While in Dendrobium the two

Fig. LII.

Fig. LII.—(Dendrobium striolatum).—1, five of the sepals and the labellum; 2, side-view of labellum-portion of calyx; 3, genitalia-column; 4, anther-cells; 5, pollen-masses, all enlarged.

pairs of waxy pollen-masses are free, they are in Sarcochilus attached to a gland by a tender elastic thread (caudicle). The genus Dipodium responds to the latter in this respect, except that each pair of its pollen-masses is fixed to a separate thread ; hence the name. *Dipodium punctatum* is one of our most widely distributed Orchids, particularly in forest-regions, where it is very conspicuous by its raceme of showy red spotted flowers, though it is devoid of leaves. It may be regarded as semiparasitic, its somewhat tuberous root-fibres often adhering to roots of trees or shrubs or their remnants. The latter remark applies also to another Orchid of rarer occurrence, *Gastrodia sesamoides;* but this plant belongs to a very different tribe of Orchideæ with coherent-granular pollen-masses. It derives its generic name from the turgescence of the tube of its flowers ; while the specific name (not aptly) is derived from its fragrance, resembling that of the Sesam-flowers. Neither Dipodium nor Gastrodia participate in the green coloration of most plants, both being leafless ; but while the stem of the former is of a dark-purplish hue, that of the latter is of a pale somewhat brownish color, in which the flowers also largely share. The absence of green corpuscles (chlorophyll) is often concomitant to parasitic growth of plants, as demonstrated in our own colony also by Orobanche and Thesium, although in the Mistletoes chlorophyll is largely developed. Whenever nutrition is more powerfully sustained from a plant, on which the parasite preys, than from soil, less need perhaps for the assimilation of carbon exists through decomposition of carbonic acid from the air, the oxygen of which is set partly free through the action of the chlorophyllous portions of plants under the influence of light.

Returning to subjects more immediately before us, it may be observed, that perhaps in no part of the globe the attractive beauty of the spring-herbs is surpassing ours through copiousness or elegance of orchideous plants. Few of ours are autumnal, one among them however of wide distribution, the small and slender *Eriochilus autumnalis*, generically so called, because the lip-like or rather tongue-like inner segment of the calyx being bearded. Eriochilus is however hardly more than a subgenus of Caladenia, to which the well-known *Spider-Orchid* (C. pulcher-

rima), one of the most handsome of all terrestrial Orchideæ, belongs. The beautiful glands, which in varied arrangement and colors beset and tinge the labellum, gave rise to the name Caladenia. While the sepals of the Spider-Orchid are upwards long-attenuated, they are short and not much pointed in the blue-flowered *Caladenia deformis* and the still more frequent pink-flowerd *Caladenia carnea*, while its large and broad leaf distinguishes *Caladenia latifolia*. Other species are rarer than these ; all bear only a solitary leaf, by which means the Caladenias can already be separated from the always two-leaved *Chiloglottis*-species. Their flowerstalks bear frequently only one single flower.

These few are singled out for explaining some of the specific characteristics of our terrestrial Orchideæ, because one or the other of the Caladenias is sure to be at hand for examination anywhere in the spring. The sixth volume of the Flora Australiensis can be consulted for demarkation of these and allied plants ; and excellent drawings of some of them are also published in Miss Charsley's atlas of the "Wild Flowers growing around Melbourne." It is beyond the scope of these pages to define even in faint outline only the limits of the genera and species, which interest us as indigenous more particularly ; but it is here worthy of instructural remark, by what main-notes the principal other genera of this lovely group of plants can be readily recognised by any beginner of the study of plants. Acquainted with some Caladenias he may recognise the Glossodias (one of which here only common : *Glossodia major*) by the absence of the stalked glands of the labellum and by the presence of a tongue-like basal appendage, from which this genus derives its name.

In Cyrtostylis and Acianthus the labellum is also smooth or nearly so, but it wants the appendage of Glossodia ; the pollen-masses in each cell of the anther of Cyrtostylis are two, in those of Acianthus four. The curved column gives the name to the former genus, the upwards much narrowed sepals to the latter. Our species are *Cyrtostylis reniformis* and *Acianthus exsertus*. In Lyperanthus the broadness of the upper sepal constitutes the main-distinction from Caladenia. It was designated generically from the gloomy darkness of its flowers, but the flowers of *Lyper-*

anthus nigricans are rather of a rich red tinge. This Orchid is also remarkable as almost our only one of copious occurrence in sandy desert-country unless perhaps Microtis porrifolia. In drying this plant turns completely black. All the above-mentioned genera of the Caladenia-group have the labellum almost or quite sessile. This note affords at once the means of separating them from a series of genera with a distinctly stalked labellum, to which Pterostylis and Caleyana here belong. Both these are further singular for the irritability of their labellum, which in Pterostylis protrudes downwards, but on the slightest touch snatches upwards on to the upper sepals ; precisely the same movement takes place in Caleana, but as the flowers of that genus are turned upside down by a twist of their stalklet, the labellum is in an erect posture while stretched out, and becomes deflexed by irritation. This extraordinary sensitiveness and spontaneous movement serve the purposes of fertilization, as insects become thus allured and entrapped, when alighting on the labellum, and in their endeavor to escape are apt to carry the pollen to the stigma of the same flower, or by touching the viscid stigmatic fluid and subsequently the anthers, may fix the pollen-masses to any portion of their body and carry them to the stigma of flowers of another individual plant or effecting hybridisation to another species. In a superb work, commenced by Mr. Fitzgerald, on the Orchids of New South Wales, many observations also are recorded on the fertilisation of these plants, irrespective of descriptive details, which accompany the splendid illustrations. *Pterostylis* differs from Caleana furthermore in the broadness of the upper sepal, to which is added by the adherence of the lateral sepals, also in the concrescence of the lower sepals and in the winglike expansions of the genitalial column, from which the generic name is derived, not extending to the base. The green color of the flowers gives these plants also a strange aspect. Of Caleana, named in honor of Mr. G. Caley, a botanic emissary of Sir Jos. Banks to New South Wales, we possess only *Caleyana major*, and this very sparsely ; but Pterostylis is represented by at least a dozen species in our colony, all fully described in the Flora Australiensis, vol. vi. Of the remaining genera of our Orchids Spiranthes, with one almost alpine

species, *Spiranthes australis*, is at once separable from all others by the spiral arrangement of the flowers in its spike. *Thelymitra*, as stated before, is already remarkable for the almost complete conformity of the sixth sepal with the five others. Its name comes from the somewhat cap-like expansion of the column over the stigma (and anther). Calochilus unites in some measure most of the characters of Thelymitra with the papillar beautiful lip of Caladenia; hence the name. Only one species and this sparingly, *Calochilus campestris*, is a native of Victoria. Well marked is Diuris, comprising our *Doubletail-Orchids*, when the tail-like narrow lower sepals are contrasted with the rest, petal-like in form and color. There is only one other genus in Victoria, which in this respect could be confounded with Diuris, namely Orthoceras, but the two narrow outer sepals are turned upwards, suggestive of the name, forming horns; the only plant of the genus is *Orthoceras strictum*, narrow-leaved like all of Thelymitra and Diuris. Perhaps the most common of all our Orchids is *Microtis porrifolia*, it growing as well on pastures, as on heaths and in forests, even in deserts. The smallness of its green spicate flowers render it recognised at once, although a second and much rarer kind, M. minutiflora, exceeds it still in the extreme minuteness of its flowers. The specific expression of M. porrifolia refers to the cylindric and so far leek-like leaf; the generic appellation resorts to the minute appendages, by which the genital column is auriculated. To Microtis stands in close relation the genus *Prasophyllum*, literally translated: "Leek-leaf;" the flowers are however turned upside down (resupinate), like in Orthoceras, Caleyana, Gastrodia and the following genus Cryptostylis; both in Prasophyllum and Microtis the flowers are spicate or nearly so, though the longer ovaries of the former give them a racemose appearance (as if seated on stalklets). Real racemes occur in Thelymitra, Diuris, Dipodium, Gastrodia and rarely in Caladenia, the stems of the latter usually bearing only a single flower. Pterostylis includes species with racemes, spikes and solitary flowers. From any kind of ground of the lowlands up to the glacier-regions of the alps Prasophyllums may be found. Cryptostylis, though placed by structural affinity near to Praso-

phyllum, is habitually very distant by its dilated leaves ; from Calochilus it differs already in the smooth labellum. The name designates the extreme shortness of the thus concealed column. The only Victorian species, *Cryptostylis longifolia* is by no means often to be met with. There remains to be considered as belonging to our native Flora only Corysanthes, with as yet an only one noticed : *Corysanthes pruinosa*, but perhaps others occur, four being known from the vicinity of Sydney, all of great external reemblance. These humble shade-liking plants, all carefully delineated by Mr. Fitzgerald in his work on Australian Orchids, produce a solitary tender heartshaped leaf, like Acianthus and Cyrtostylis, near to which a conspicuous single flower of dark cherry-color is seated. Corysanthes deducts its name from the helmet-like upper sepal, the four other sepals being quite diminutive, while the large labellum is ventricous or almost funnel-shaped, with a curvature.

XX.—THE LILIACEOUS
AND ALLIED PLANTS.

The white Lily of Palaestine, whose glory surpassed all splendor of Solomon and which adorns almost any gardens even here, is typic of this order. Ovid's poems let it arise from the milk of Juno ; Virgil speaks of it in raptures, and so grand a plant must indeed have attracted the attention of every ancient writer. Theocritos, about 250 years before the Christian time, does not call it by its Latin name Lilium, but gives it with other Greek writers the name Crinum (or Krinon), which however was applied also to other kinds of Lilies in the earliest literature of our race. In modern writing of science Crinum is confined to a genus of Amaryllideæ, not dissimilar to that of the ordinary Lily, but

having like all amaryllidous plants the calyx adnate to the fruit, not (as in all Liliaceæ) free from it. This showy genus Crinum furnishes also Victoria with a beautiful species, the *Murray-Lily* (Crinum flaccidum), not however to be found away from the Murray-River southward.

How strikingly different the external features of plants may be, though floral structure may draw them into congruity, is well demonstrated by our so-called *grass-trees*, which pertain truly to the liliaceous order. These scientifically defined as Xanthorhœas from the exudation of yellowish sap, which indurates into resinous masses, have all the essential notes of the order, so far as structure of flowers and fruits is concerned, but their palmlike habit together with cylindric spikes on long and simple stalks is quite peculiar and impresses on landscapes, when these plants in masses are occurring, a singular feature. In a similar manner but by very different forms other huge Liliaceæ give to some other countries a particular floral physiognomy ; so the gigantic Agaves and Fourcroyas in Central America, so the Cordylines or Palm-lilies and the amarmyllideous Phormium or Flax-lily in New Zealand, so treelike species of true Aloes in South Africa, so again the large Yuccas in North America, the colossal Dracæna in the Canary-Islands, and our own Spear-lily or Doryanthes. Inasmuch as all these grand plants have found places in any pretensive gardens also here for scenic effect, the young student will find ready facilities to investigate the structure of the flowers and fruits of these noble liliaceous plants.

The sepals of grasstrees are six and petal-like ; stamens six, adnate to the calyx ; anthers dorsifixed, two-celled ; style simple ; stigma undivided ; ovules numerous ; fruit three-celled, dehiscent into three valves ; seeds 1–2 ripening in each cell, black, without any appendage ; embryo curved, placed transversely in the albumen. In Victoria the number of Xanthorrhœas is reduced to two, although about a dozen species are comprised within the genus, which stretches over large portions of Australia but not, so far as known, beyond it. Our stem-bearing species, X. australis, is not a tall one ; the second, X. minor, forms dwarf tufts with numerous flowerstalks and short spikes in heathy moist tracts,

covering in various particular southern districts occasionally a vast extent of country to the exclusion of almost all other conspicuous plants.

Our Liliaceæ present us with several curious forms ; thus the genus Thysanotus comprises the *Fringe-lilies*, one of which, Thysanotus Patersoni, is a delicate humble climber. A kind of Fringe-lily is included also in the genus Arthropodium, its three inner sepals being fringed like in Thysanotus ; but the filaments of the former are bearded, those of the latter are smooth. Both genera produce here purple flowers ; but while the seeds of Arthropodium are without appendages, those of Thysanotus are appendiculate. The Grass-lily, which during spring gives to many of our meadows by its frequency quite a purple hue, is Arthropodium strictum. The genus-name arose from the articulated stalklets of the flowers. Other genera with bearded stamens occur here ; for instance Bulbine, Tricoryne, Stypandra and Dianella ; of these *Dianella* produces berries usually of beautiful blue color. Bulbine and *Stypandra* have both valvate dehiscent fruits, the latter genus sharing in the rigid habit of the Dianellas and receiving its name from the beards of the filaments. The most common of the two Australian Bulbines contributes by its racemes of yellow flowers much to the gayness of our flower-fields during spring ; this is *Bulbine bulbosa*, whereas its tender sister, Bulbine semibarbata, has half the stamens smooth and a fibrous not tuberous or bulbous root. That of Bulbine bulbosa formed in a roasted state a portion of the vegetable aliment of the natives in times past. *Tricoryne elatior*, a common branched herb with small yellow flowers received its generic designation from the three somewhat club-shaped lobes, of which the fruit consists. The searcher of plants during our spring months cannot fail to gather the humble *Chamæscilla corymbosa* or Dwarf-squill with its lovely blue flowers. It differs from the allied Cæsias in its few flowers, neither

es nor spirally twisted after flowering, also in
often many seeds contained in each of the
it, the seeds being moreover lenticular-com-
and destitute of an arillar appendage or
zta is the common blue-flowered Grass-lily

of our meadows; it took its name from a botanist of the seventeenth century.

Two of the most gregarious of our smaller Liliaceæ belong to a tribe, the main-distinction of which is obtained from its trifid style. One of these two plants is the first harbinger of the spring, as it bursts forth into flower, much like the snowdrop indicates the first effects of the warming rays of the spring-sun in the European North. Ours, *Anguillaria australis*, is however altogether a very different plant, as the illustrations evince (Fig. LIII. and LIV.). To demonstrate the playfulness of this pretty and in many respects remarkable plant, its three principal forms, distinguished by Robert Brown as

Fig. LIII.

Fig. LIII.—(Anguillaria australis).—1, total plant staminate; 2, leaves and flower-spike of pistillate plant; 3, leaves and flower-spike of bisexual plant; 4, one-flowered variety; all natural size.

species, are given in the delineations. Thus it will be seen, that in one variety staminate and pistillate flowers proceed from distinct plants; in the second variety bisexual flowers form a spike; in the third a solitary flower with both stamens and pistils terminates the stem.

FIG. LIV.

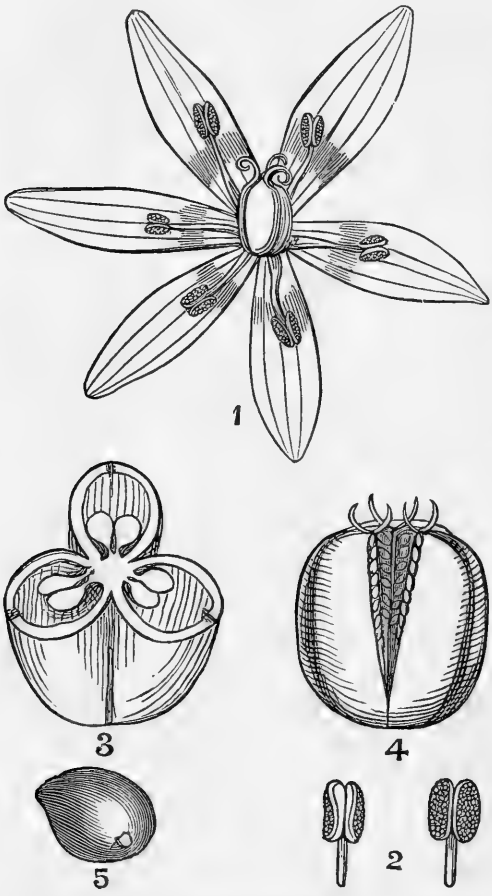


FIG. LIV.—(Anguillaria australis).—1, a bisexual flower; 2, anthers; 3, transverse section of ovary; 4, ripe fruit; 5, a seed; all enlarged.

Anguillaria bears the name of the administrator of the Botanic Garden of Padua, three centuries ago. The other very frequent three-styled liliaceous plant, to which was referred, is *Burchardia umbellata*, named in honor of a physician and philosopher, who early promoted the natural system of plants. The radiating stalklets of the flowers, forming an umbel, render among any coordinal plants this at once recognised; it is also remarkable for its fruit, which from the commencement is split into three fruitlets.

From Liliaceæ the transit to Palm-like plants and Rushes is almost gradual, and intermediate genera occur, which bring the *Rushes* or Junceæ even in contact with the

Sedges or Cyperaceæ, although the latter belong already to that main-division of Monocotyledoneæ, called Glumaceæ, in which the six-sepalled calyx of Rushes is missing, the glumes or scalelike bracts protecting like in grasses the stamens, the pistil and finally the fruit. The decrease of the sepals and stamens commences in the order of *Restiaceæ*, a group of plants transitory from Junceæ to Cyperaceæ, and to which therefore with propriety in vernacular language the name *Rush-Sedges* might be given. Restiaceæ, mainly represented in extra-tropic Australia and South Africa, are not uncommon here, and no difficulty exists in distinguising them already from any Cyperaceæ by the very obvious note, that their leaf-stalks are not forming a closed cylinder, but are slit longitudinally like in Grasses. From real Junceæ, whose habits they often share, they can be separated irrespective of the often less perfect flowers by the embryo being placed outside of the albumen. Restiaceæ also with rare exceptions have unisexual flowers and one-celled anthers.

XXI.—GRASSES

AND OTHER GLUMACEOUS PLANTS.

In the preceding pages some of the principal distinctions between Rushes and Sedges were pointed out; it is necessary now to give the means of discriminating between the latter *(Cyperaceæ)* and the *Gramineæ*, both orders constituting the Glumaceæ; so called because bracts or glumes solely support the stamens and pistils, no sepals being developed in glumaceous plants, unless for them are substituted bristlets or rudimentary scales. The separation of the Glumaceæ into their two great orders is easy enough. Cyperaceæ possess usually solid stems; their leafstalks form clasping cylinders not slit; sepals absent or bristlets rarely scales instead

of them ; anthers basifixed, one bract to each fruit ; embryo at the bottom of the albumen.

Gramineæ exhibit usually hollow stems, always with distant nodes ; leafstalks slit longitudinally ; sepals absent, or only two rarely more or one rudimentary scales instead of them ; anthers often versatile and bilobed ; two unequal bracts to each fruit ; embryo lateral at the base of the albumen.

The genus *Cyperus* has the bracts of its florets arranged into two rows forming spikelets, all bracts flowering, but no bristlets or scales around the fruit. *Scirpus* contrarely has the bracts in many rows around the axis of the spikelets and all or mostly flowering, while the fruit is surrounded by bristlets. *Schœnus* differs from Cyperus in having only a portion of the bracts flowering in each spikelet. *Chætospora* differs from Schœnus in having, as the name implies, bristlets surrounding the fruit. *Lepidosperma*, to which our flat-stemmed Sword-sedges belong, is remarkable for having six minute connate scales around the fruit. *Carex* is recognised by having always unisexual florets, the females provided besides the usual bract with two connate enclosing bracteoles. This may suffice to show to some extent, on what notes the generic distribution of the cyperaceous plants is founded. The genera above mentioned, except Lepidosperma, which is nearly endemically Australian, are represented in almost all countries. Lepidosperma gladiatum, the great Swords-edge of our coasts, furnishes an admirable material for writing-paper ; but as a rule the direct use of cyperaceous plants is very limited, most of them being too harsh to be available for fodder unlike a multitude of nutritious tender grasses. In one respect however they fulfil important functions in the economy of nature, which has created all organisms for their destined purposes. On swamps and in bogs cyperaceous plants take largely possession of the ground and in unceasing growth assimilate from air, water and soil their food, which in the annual decay of portions of the plants is stored up on the spot, forming soil for final occupation of pastoral or otherwise utilitarian vegetation.

Grasses comprise the most important alimentary plants of the whole globe, whether for man or for that portion of the animal crea-

tion, which supplies us mainly with fleshy food. The study of these inestimably precious gifts to mankind must ever be one of the utmost significance. All cereals are graminous, whether Wheat or Rye, whether Barley or Oats, ripening in colder zones, whether Maize or Rice, which prosper in more genial climes. We little think, when daily relishing sugar as a now indespensable requisite of life, that the uncomparable Cane is a grass, which within the girdles of the tropics cannot be superseded by the Beet. The verdure, on which our eyes daily rest, is far more extensively constituted by these mostly humble plants, than even by the spacious and expansive trees of the forests. In this little work, specially written for Australian youths, it has been endeavoured throughout to choose only native plants for exemplification; but from the vast assemblage of our grasses, even some hundred species indigenous to Australia, but very few can be considered within the scope of these pages. Rich as our continent is in Gramineæ it remains a memorable fact, that scarcely any Bamboos occur anywhere within its limits, while in our mere crossing the narrow straits of the ocean, which separate Australia from the Indian islands and the Asiatic continent, these magnific towering forms of vegetation are at once in manifold forms brought before us. Everyone is acquainted with our *Kangaroo-grass* (Anthistiria ciliata), long known before Australia became colonized, in South Asia and all Africa. Why the younger Linné should have connected the flower-festival of Bacchus with this plant, if really the name was changed from Anthesteria, is difficult to conceive.

If any of the little clusters of florets of a Kangaroo-grass are dissected, it will be found of a complex structure; four sessile staminate or empty florets surround a bisexual flower, besides two stalked staminate florets being placed with them additionally; then the outer bract of the bisexual flower is terminated by a long bristle or awn, to which in scientific language the name arista is applied, an expression used in this sense already by Cicero. In the species of Poa or *Meadow-grass*, Festuca or *Fescue* and Bromus or *Brome-grass*, which genera all are pertaining to our native flora, the structure of the flowers is simple, each spikelet consisting of two rows of florets, arranged like those of a Cyperus. The Desert

Spinifex of our colonists is a Fescue, but a true *Spinifex* occupies our sand-shores; its aggregated flowers form large clusters, roundish-expanded and pungent on the fruiting plant. Tennent remarks, that the radiating heads become detached when the seed is matured, and are carried by the wind along the sand, over the surface of which they are propelled by their elastic spines, dropping their seeds as they roll onward; the heads are so buoyant as to float lightly on water, and while their uppermost spiny rays act as sails, they are carried across narrow inlets, to continue the process of embanking. In the genera *Stipa* and *Agrostis*, both well represented in Victoria, the structure of the grass-flower is of the simplest kind, each floret being separated and bisexual, consisting of the normal two outer bracts or glumes

Fig. LV.

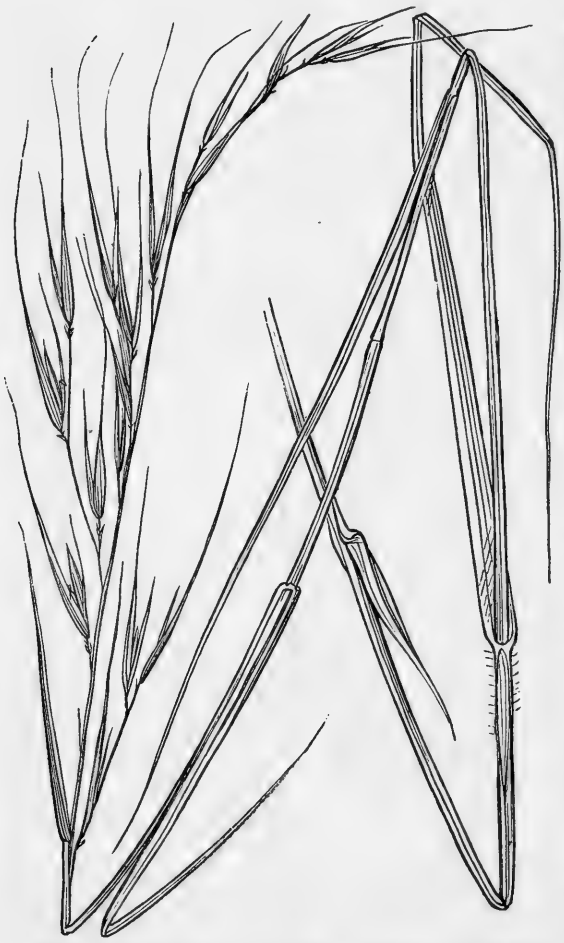


Fig. LV.—(Ehrharta stipoides).—Portion of the grass in general outline.

and two inner bracts or glumels ; but while in Agrostis the inferior of the inner bracts bears the awn either below its summit or is destitute of an arista altogether, it will be noticed, that in Stipa the corresponding organ carries the awn terminally and by an articular insertion. As a general rule the bracts and awns of the species of Agrostis are much smaller and shorter than those of a Stipa. *Aristida* differs from the latter genus in nothing essentially but a trifid awn. One of the most universal of all our grasses is the *Danthonia penicillata*, which displays an extraordinary versatility of forms. This genus was named in honor of E. Danthoine of Marseilles. The structure of the flowers is formed on the plan of a Fescue, but the lowest pair of bracts is far the longest, the outer bract of each floret is bearded at the base as well as middle, and terminated by two short lateral awns and one elongated terminal twisted awn. It would lead

Fig. LVI.

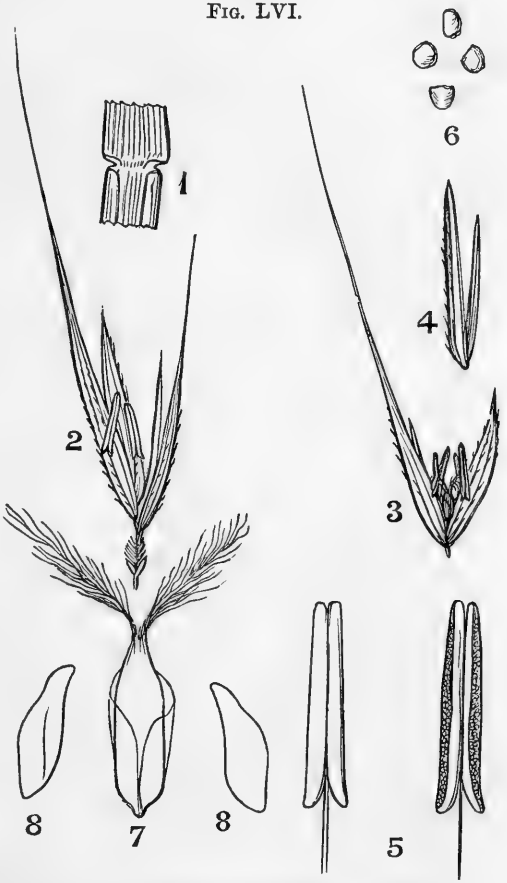


Fig. LVI.—(Ehrharta stipoides).—1, base of leaf and summit of leafstalk ; 2, a complete flower ; 3, flower, the lower bracts removed ; 4, inner bracts ; 5, anthers ; 6, pollen-grains ; 7, pistil with sepaline scales ; 8, sepaline scales ; 5–8, much magnified.

too far, to continue these expositions on this occasion; but what is said may initiate the young observer to an investigation of any grasses close at hand; from this he is sure to derive soon much pleasure and useful recreation, the interest of which can easily be sustained by reference to any descriptive work on Gramineæ, as a large repetition of general forms of this class of plants is noticable in every part of the inhabitable earth.

To give a first insight into the structure of grasses by an illustrative delineation now a figure of Ehrharta stipoides, one of our most universally diffused and ever-flowering grasses is presented. The genus was dedicated by the Swedish traveller Thunberg to the Swiss naturalist Ehrhart, a disciple of Linné and scientific writer on grasses.

XXII.—FERNS

AND ALLIED PLANTS.

To commence, a definition of Filices (real Ferns) is given.

Foliage forming fronds, rarely leaf-like, usually bearing fruit-masses (sori) on the underpage or margin. Staminal and pistillar organs (antheridia and archegonia) only developed on the underside of a minute scale (prothallus) formed at first germination, unaidedly not visible. Individual fruits (sporangia) very minute, one-celled, mostly tender-membranous, with numerous spores (exembryonate seeds) of extreme minuteness.—Fronds usually coiled before development.

Suborder 1.—Polypodiaceæ.

Fruitmasses dorsal or marginal, very rarely terminal. Spore-cases usually stalked, incompletely encircled by a jointed longitudinal elastic ring; dehiscence (manner of bursting) transversal.

SUBORDER 2.—HYMENOPHYLLEÆ.

Fruitmasses marginal. Sporecases mostly sessile, placed along an elongated axis ; ring diagonal or transversal or almost longitudinal, complete ; dehiscence longitudinal or almost transversal.

SUBORDER 3.—GLEICHENIACEÆ.

Fruitmasses dorsal. Sporecases sessile ; ring transversal, complete ; dehiscence longitudinal.

SUBORDER 4.—OSMUNDACEÆ.

Fruitmasses terminal or dorsal. Sporecases stalked ; ring very incomplete, transversal ; dehiscence vertical or longitudinal.

SUBORDER 5.—SCHIZÆACEÆ.

Fruitmasses terminal or marginal. Sporecases sessile, basi- or dorsi-fixed ; ring terminal, lidlike ; dehiscence longitudinal.

SUBORDER 6.—OPHIOGLOSSEÆ.

Fruitmasses terminal. Sporecases sessile, without a ring ; dehiscence longitudinal or by lateral position of the sporecases apparently transversal.

Lycopodiaceæ (the Clubmoss-tribe). Sporecases axillary or spicate, terminal, 2–4-valved, 1–3-celled ; when of two forms the larger containing only one or few spores.

Lycopodiaceæ are not Ferns in the strict sense of the word ; in foliage they rather approach Mosses ; in fruit they differ from either, with a nearer alliance however to Ferns. Among *acotyledonous plants* (Cryptogamæ) they form with true Ferns, with Mosses *(Musci)* and Lichenasters *(Hepaticæ)* and with the small orders of *Marsiliaceæ* and *Characeæ* (Equisetaceæ not being represented here) a class or primary division, called *Acrogenæ,* because their axis of growth is usually definite, and its increment upwards ; whereas in the remaining orders of Acotyledoneæ, namely : *Lichenes, Fungi* and *Algæ* usually no definite (stem- or branch-like) axis exists, while the growth of these plants in most

instances takes place laterally, marginally or peripherically, for which reason they are called *Thallogenæ:* Many Mushrooms however produce stemlike organs, while again numerous Algæ and Lichens form stems and branches and even (as in some Caulerpæ) leaflike segments. Again some Hepaticæ form thallus-like flat expansions, so far resembling rather Lichens though more determinate in form. Nevertheless all Thallogens are well separable from all Acrogens by the structures of their fruits ; but these are examinable only by the aid of a compound microscope and not easily brought within the reach of exact scrutiny of tyros, for whom these pages are written, practical instructions for preparing the delicate microscopic objects being required. Still in collections made by beginners, also these plants should not be neglected, so as to render the material available for study at any future time, and to make the young student at the very outset familiar with at least the external forms of these plants. Of Marsiliaceæ we have well known examples in the *Nardoo* (Marsilea quadrifolia with many varieties), the foliage resembling that of a Clover with four leaflets ; further in the *Azollas* (Azolla Magellanica and A. pinnata) which in large often purplish sheets float like duckweeds (Lemnas and Wolffias) on the surface of tranquil waters. *Charas* (and the closely allied Nitellas) grow submersed in water, and are easily recognised among plants of fresh or brackish water by their whorl-like branchlets, which resemble segments of foliage.

By far the greatest number of Ferns belongs to the suborder or tribe of Polypodiaceæ, as well here as elsewhere. The genera are mainly founded on the form and position of the fruitmasses and on the shape or absence of the involucre. Those represented in our colony, may be recognised by the following brief definitions, the explanation of fuller details being beyond the scope of this introductory book.

I.—Polypodiaceæ.

Dicksonia: Fruitmasses marginal, roundish. Involucre, bivalved or cupshaped. Receptacle elevated.

Cyathea: Fruitmasses dorsal, roundish. Involucre cupshaped. Receptacle elevated.

Alsophila: Fruitmasses dorsal, roundish. Involucre absent. Receptacle elevated.

Polypodium: Fruitmasses dorsal, roundish. Involucre absent. Receptacle depressed.

Hypolepis: Fruitmasses marginal, roundish. Involucre univalved, reflexed. Receptacle depressed.

Davallia: Fruitmasses marginal, roundish or elongated. Involucre univalved or cylindrical. Receptacle depressed.

Cheilanthes: Fruitmasses marginal, confluent. Involucre lobed or imperfect, reflexed, hardly defined.

Notholæna: Fruitmasses marginal, confluent. Involucre formed by the reflexed margin of the frond or obliterated.

Adiantum: Fruitmasses marginal, short, distinct, rarely confluent. Involucre formed by the reflexed margin of the frond, well defined.

Lindsaya: Fruitmasses marginal, linear. Involucre linear, opening outward.

Pteris: Fruitmasses marginal, linear. Involucre linear, opening inward.

Lomaria: Fruitmasses linear, on the underside of contracted separate fronds. Involucre linear, opening inward.

Blechnum: Fruitmasses dorsal, linear, along the midrib of the unchanged frond. Involucre linear, opening inward.

Doodia: Fruitmasses dorsal, linear or elongated, along or near the midrid of the unchanged frond. Involucre confluent or univalvular, opening inward.

Asplenium: Fruitmasses dorsal, elongated or linear, dispersed. Involucre linear or narrow, opening on one side.

Aspidium: Fruitmasses dorsal, roundish. Involucre free, except at the point of insertion.

Grammitis: Fruitmasses dorsal, linear or elongated. Involucre absent.

II.—Hymenophylleæ.

Trichomanes: Involucre tubular. Fruit-axis hairlike, exserted.

Hymenophyllum: Involucre bivalved. Fruit-axis generally enclosed.

III.—Gleicheniaceæ.

Gleichenia (one genus only).

IV.—Osmundaceæ.

Todea: Fruitmasses dorsal.

V.—Schizæaceæ.

Schizæa: Sporecases basifixed, placed unilaterally along paired or crowded terminal segments of the frond, without scaly involucres.

VI.—Ophioglosseæ.

Ophioglossum: Sporecases two-rowed, horizontally connate into a spike.

Batrychium: Sporecases two-rowed, distinct, forming a pinnate panicle.

A few notes for discriminating our principal ferns are offered, as these mostly graceful and lovely plants are the delight of so many cultivators, and form such delicate specimens when dried for collections. Of Ferntrees we have four, of which however only two are frequent; but they are among the most magnificent in our vegetation, impressing on it a tropical grandeur. The most important of these two for cultural purposes is the valley-treefern, *Dicksonia antarctica*, because it is among more than two hundred Ferntrees, now known from all the great divisions of the globe except Europe, one of the best adapted for removal to gardens or conservatories in an aged upgrown state. Tall individuals must have required half a century's growth to attain their imposing size. The stem is stouter than that of the Hill-treefern, *Alsophila australis*, which occupies drier ground on the slopes of forest ridges and surpasses even D. antarctica in height. Both are most easily distinguished from each other by the generic characteristics of the fruit as given above; but a second Dicksonia, D. squarrosa, forms a slender not tall treefern in the Dandenong-Ranges and perhaps elsewhere; it is of rare occurrance, and has a very

different structure of the stem. A fourth arborescent Fern, known to attain a height of fully half a hundred feet, the *Cyathea medullaris*, occurs in the Cape-Otway Ranges. This latter with our two ordinary treeferns stretches to Tasmania, East Australia and New Zealand, and D. antarctica advances furthermore very sparingly into South Australia, where however Alsophila australis is not to be met with. The Alsophila is so similar to Polypodium in fruit, that it could be placed into that genus, were it not for the elevated receptacle, on which the fruits are seated; of species of Polypodium, several occur in our colony, all confied to moist forest-tracts. *Polypodium pustulatum* (or P. Billardieri) with usually jagged fronds, *Polypodium grammitidis* with small pinnatifid fronds, *Polypodium australe* with undivided fronds and the two latter species with elongated (not roundish) fruit masses, grow usually on mossy stems and branches of trees. So also grows on Ferntrees in East Gippsland *Polypodium serpens*, a small species with thick fronds. *Polypodium punctatum* (or P. rugosulum) is a terrestrial tall species with much divided and usually somewhat hairy fronds. To this the Hypolepis tennifolia is very closely cognate.—*Cheilanthes tenuifolia* is the most widely distributed of all our Ferns, and the only one extending into the desert; it is a dwarf species with much dissected fronds; the genus derives its name from the liplike lobes of the margin of the frond, under which the fruit is lodged. Rarer but also occuring in arid regions is the Notholæna distans; it is more hirsute than the Cheilanthes, its fronds are less copiously lobed and the involucre is almost undeveloped; hence the generic name. Of the genus Davallia we have in Victoria three species; *Davallia dubia*, which tends towards the genus Dicksonia, and is conspicuous on the outskirts or the open parts of forests by its light-green color and much compounded large fronds. It proceeds not further westward. The second species *Davallia pyxidata* is very rare here; as yet it is only found within the boundaries of our colony in the Grampians, and it is singular for the tubular involucre of its fruit. The third of our species is *Davallia flaccida* (also described as Dicksonia davallioides), a spacious Fern with extremely tender and delicately divided fronds, as yet only gathered here towards

Cape Otway. The genus Davallia was dedicated in honor of an observer of Swiss plants at the end of last century.—In damp heathy moors grows often the small and unbranched *Lindsaya linearis*, named after a resident of Jamaica, who first of all at the end of the last century cultivated Ferns from spores. Of our three Adiants, *Adiantum Æthiopicum*, *A. formosum* and *A. hispidum*, the first named is the well know Maiden-hairs Fern, of wide distribution ; the two others occur with us only in East Gippsland, A. formosum being a large and most elegant species. The name of the genus from the Greek is to indicate, that these Ferns do not absorb moisture with the facility of most other plants ; thus we see them often glittering with dew and raindrops. Pteris includes among Victorian Ferns more species than any other genus. *Pteris aquilina* is the same specifically as the British Braken and the most gregarious of all our Ferns, often a detriment to grassland and forming sometimes almost thickets along riverbanks. It passes also under the vernacular name Eaglefern, on account of its root, which when cut across exhibits dark-brown cellular tissue surrounding vascular bundles, by which means some approach to the outlines of an eagle is presented. *Pteris falcata* stands next in frequency ; it is a simply pinnate rigid small species, the pinnæ being almost sickle-shaped as the name implies. All the other native Pteris-ferns are restricted to forests. *Pteris incisa* (or P. vespertilionis) is recognised by the grey-green tender ample frond. *Pteris comans* is similar, but dark-green on both pages. *Pteris arguta* (or P. tremula) resembles in outline the Braken-fern, but the frond is of tender membranous texture. *Pteris umbrosa* and *P. longifolia* are here only occurring in East Gippsland ; both have long pinnæ, those of the former confluent, those of the latter much narrower and always undivided. Pteris is since more than 2,000 years the name for the Braken and a few other Ferns in Greece.

The Lomarias are here represented by *Lomaria Capensis* (or L. procera), the most gigantic among Victorian congeners and the most common also in humid localities along watercourses or in the forests. Nearly as common and growing in circular tufts is *Lomaria discolor*, recognised from all others by the paleness of

the underside of the frond, as the name implies ; the pinnæ moreover are not free at the base as in L. Capensis, but all adnate. In the same respect stand to each other *Lomaria fluviatilis* and *Lomaria lanceolata* of our Ferntree gullies, both being much smaller plants than our common Lomarias. Smaller still is the neat *Lomaria alpina* of the frosty height of our alps, where it lines the rivulets. *Lomaria Patersoni*, discovered by Governor Paterson, has simple lanceolar or few-lobed sterile fronds. Only one Blechnum is as yet found in our territory, namely *Blechnum cartilagineum*, with segments of the frond (or pinnæ) adnate at the base. But an East-Australian species, B. lævigatum is so similar to Lomaria Capensis, except in its fruit, that it may have been passed unnoticed.

The genus Doodya, dedicated to an early exact observer of acotyledonous plants, effects a transit from Blechnum to Asplenium; it combines the shape of the fruitmasses and involucre of Asplenium with more of the longitudinal position of the sori of a Blechnum, not however forming a single uninterrupted line of the fruits on each side of the midrib. Doodya may be regarded as a section of the older genus Woodwardia. *Doodya aspera* is the larger of two species occurring in our Ferntree gullies ; it has generally all the segments of the frond adnate at the base, while *Doodya caudata* (or Woodwardia caudata) has the lower pinnæ free. The genus Asplenium is represented by five species in Victoria, unless others from New South Wales should yet show themselves in the hitherto secluded forests of East Gippsland; to the latter regions is restricted in our colony also *Asplenium Nidus*, singular for its large fronds circularly arranged. Equally rare is *Asplenium trichomanes*, a species remarkable like the following (and also like Aspidium aculeatum, Pteris aquilina and Hymenophyllum Tunbridgense) for its wide diffusion over the globe. It is a tufted small but rigid Fern with minute segments, pinnately arranged. *Asplenium marinum* is so variable, that its principal varieties are generally regarded as distinct species. In all its stages it is a conspicuous Fern, with simply or doubly pinnate fronds and often incised segments. The typical Fern from coast rocks is dwarf, less divided and unusually of thick leathery texture ;

a taller variety of larger growth and thinner fronds occurs in damp forests, viz., A. bulbiferum, so called because young plants may spring from bulblike swellings on the summit of the fronds; the third form is fond to grow on mossy springy rocks or Fern-stems, from which it gracefully depends, viz., A. flaccidum; it is slender, but of thick consistence and the fruitmasses are almost marginal on small undivided segments. *Asplenium furcatum* has been noticed in our colony as yet only near Portland; it somewhat resembles the more dissected forms of the foregoing species, but the pinnæ are still more divided, and upwards dilated and toothed, while the axis and stems are woolly-hairy. *Asplenium flabellifolium* is one

Fig. LVII.

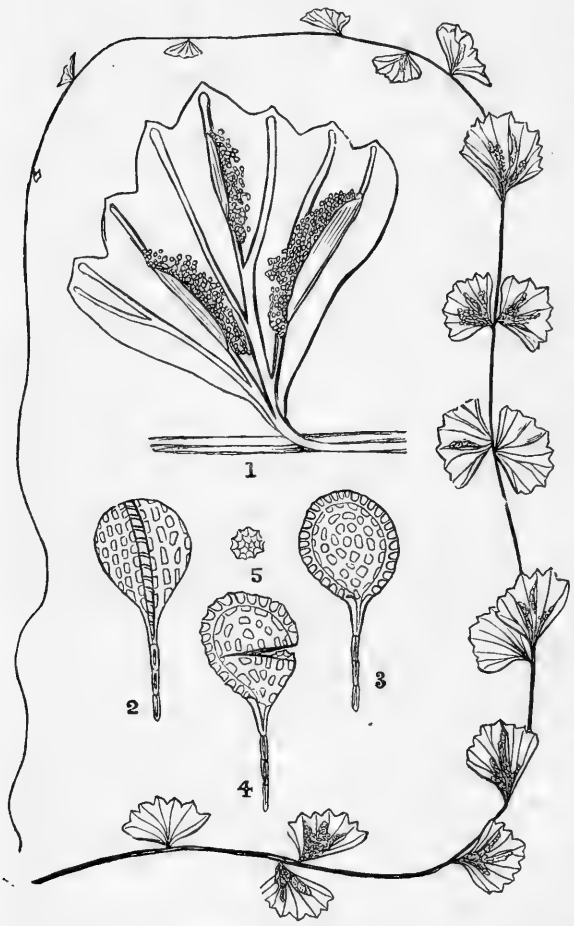


Fig. LVII.—(Asplenium flabellifolium).—1, a separated segment of the frond; 2, dorsal view of a spore-case; 3, lateral view of a spore-case; 4, a spore-case burst; 5, spore.

of the most frequent and also one of the most delicate of our Ferns, remarkable for its creeping habit and the filiform leafless prolongations of its fronds, as will be seen on reference to Fig. LVII.; young plantlets not rarely spring from the summit of the extended axis. *Asplenium umbrosum*, one of the rarer of our forest-ferns, with spacious much divided fronds, can at once be recognised by the almost cylindric or tumid involucres, which usually burst irregularly. One European species bore already in the most ancient medical works the generic name, because it was in use as a remedy in spleen-diseases.

Another of our prominent genera of Ferns is Aspidium, so designated on account of the shield-like involucres covering the fruitmasses. The rarest among them is *Aspidium hispidum*, as yet only known from the Cape Otway ranges and New Zealand. The bristly hair, which densely beset the stalks and axis, render this species easily recognised. On our Ferntrees we find not unfrequently *Aspidium Capense* (or A. coriaceum) with thick comparatively broad smooth fronds, much divided pinnæ, rather large involucres and often black fruitmasses. The most common of ours is *Aspidium aculeatum*, but it never extends to dry localities and has a predilection for cool spots, thus growing most vigorously here in the alpine zone. The fronds are not so broad in proportion to length as those of the preceding species; the plant is beset with often dark scales and the teeth of the fronds are very acutely pointed. The two other Aspidiums, known from Victoria, belong to a section or subgenus, called Nephrodium, because the involucre is kidney-shaped or verges to that form. Of these two *Aspidium molle* is rare with us, having only been found in crevices of cliffs on Murray-River; its fronds are simply pinnate membranous and soft-downy. *Aspidium acuminatum* is repeatedly pinnate, and the ultimate segments of the fronds are acutely serrated. This Fern can be considered as a variety of Aspidium decompositum, but the root is less creeping. In A. acuminatum and A. aculeatum the involucre may become obliterated or even undeveloped, when nothing remains to exclude such stages of these Ferns from the genus Polypodium. The last of the tribe Polypodiaceæ are two species of Grammitis, one of these not uncommon even out

of forests, but always in the shelter of rocks, namely *Grammitis rutifolia;* this dwarf and downy Fern has its fronds divided somewhat in the manner of the foliage of the Rue ; hence the name. The genus obtained its appellation from the usually linear fruit-masses. The other species *Grammitis leptophylla* is the smallest and most delicate of all our Polypodiaceæ, and it is further remarkable among them for its transparent tender-membranous fronds. It is of very sparse occurrence, for which scarcity its merely annual duration, so unusual in Fern, seems to account. The pellucidity of this little Fern, so exceptional among Polypodiaceæ, is almost universal among Hymenophylleæ ; thus the latter are great favorites in the collections of dried Ferns, though their cultivation is beset with difficulties. We possess of this tribe two species of Trichomanes and two of Hymenophyllum ; they delight to grow on Fern-stems or on mossy rocks along rivulets in deep shady ravines exposed to the spray of cataracts or bathed in dew, and they beset often the Fern-stems so densely, as if they were clothed in the most beautiful shining green silk. *Hymenophyllum Tunbridgense* differs in the minutely serrated fronds from *Hymenophyllum demissum.* One of the Trichomanes is here and indeed anywhere in Australia of extreme rarity, namely *Trichomanes pyxidiferum ;* it is here a smaller plant than the following, more compound-pinnate, whereas *Trichomanes venosum,* a frequent plant on Ferntrees, has the segments of the fronds more confluent and veined. The transparent foliage of the Hymenophyllums suggested the generic name ; that of Trichomanes is of remote antiquity, applied by Theophrastos, Dioscorides and Plinius to the also here occurring Asplenium trichomanes, which was used as a remedy against loss of hair ; the modern Trichomanes alludes to the hair-like fruit-axis.

Passing to the Gleicheniaceæ we have to deal with three Gleichenias, all confined to springy valleys, where *Gleichenia circinnata* will sometimes form dense masses of wide extent. Its ramification is doubly or repeatedly forked (dichotomous), and the ultimate pinnæ consists of numerous minute roundish segments. From this curious Fern can be distinguished *Gleichenia dicarpa* only by the lobes of the pinnæ so much recurved as to

leave merely a small opening or hollow for the reception of the solitary or two or three sporecases. *Gleichenia flabellata* might be compared to a miniature-palm in habit, and differs widely from the two others by the long segments of the pinnæ, and besides in the more copious fruitlets. Gleichenia was dedicated to Colonel Baron von Gleichen, a microscopic investigator of cryptogamic plants in Germany last century. The fruitlets of the Gleicheniaceæ are not of the transparency usual in polypodiaceous Ferns.

Our only osmundaceous plant is one of the most remarkable productions of the whole vegetable empire, the *Todea Africana* (or Osmunda barbara). Its stems are often as broad as high and those of colossal specimens may be crowned by a hundred fronds or more. Instances are on record of stems without fronds having exceeded the weight of one ton, by accumulated growth during half a century or perhaps longer periods. These huge massive and bulky stem-blocks can be transferred from the deep boggy irrigated valleys of our forests to wide distances in full vitality, as first shown by the writer, and they thus adorn many a conservatory now in Britain and other countries. Our species is confined to South Africa, South and East Australia and New Zealand. The genus Todea bears the name of a North German divine of the last century in commemoration of his study and descriptions of many fungi and other acotyledonous plants. It differs merely from Osmunda in fruits not forming terminal masses distinct from the broader sterile portions of the fronds. Our two Schizæas are meager plants without leafy fronds, and are not likely to attract the attention of Fern-collectors. *Schizæa fistulosa* has usually quite undivided stems, while the narrow segments of the sterile fronds of *Schizæa dichotoma* (or S. bifida) are dichotomously arranged. Finally allusion remains to be made to the Addertongue-Fern, *Ophioglossum vulgatum*, a small plantlet, the frond of which consists of a single oval or lanceolar blade, while the terminal fruit spike has given rise to the generic appellation.

Among Lycopodiaceæ we have representatives of Phylloglossum, Lycopodium, Selaginella and Tmesipteris. *Phylloglossum Drummondi* is a minute plant, easily overlooked, with narrow

radical leaves and a stalked terminal solitary spike. The genus Lycopodium contains the so-called Club-mosses, although the name is derived from some fancied similarity of the branches of some species to a wolf's foot. The fruits of all species of *Lycopodium* are uniform one-celled and two-valved, filled with countless dustlike inflammable spores, whereas the fruits of *Selaginella* are of two kinds, the one sort akin to those of Lycopodium, the second kind 2–4-valved, including 1–6 larger spores. Of the former genus five species are known here as indigenous, of Selaginella only two. The only plant of Lycopodiaceæ, which much attracts the attention of Fern-collectors, is the *Tmesipteris Tannensis*, generically so called, because the fruits are seated in the upper notches of the deeply incised fronds. It delights to grow on Fern-stems, and it is readily recognised among allied plants by the leaflike segments of the fronds and by the very broad bilobed and two-valved fruits. The first place of discovery of this graceful Fern seems to have been the island of Tanna or Tana in the New Hebrides. To Lycopodiaceæ might also be referred our only *Isoetes*, which grows submersed, is stemless, and has tufted awlshaped leaves, the bases of which surround two kinds of fruits with larger and with subtle spores. The Greek name of the genus is to indicate, that these aquatic plants remain unchanged throughout the year, not shrivelling in their continuous growth. Our Isoetes (I. Muelleri) is within this colony as yet only known from the Barwon, where it was found by Mr. Fullagar, and from the vicinity of the Richardson-River, where it was gathered by Dr. Curdie. The species extends however to Queensland. Others may yet be sought here, particularly in alpine waters.

OMISSIONS.

Hibiscus, of which representatives may yet perhaps be found in our north-western desert-vegetation, derives its name from Greek Mythology, where it was however applied to the similar Marshmallow.

Lobelia commemorates the great services rendered to descriptive phytology three centuries ago by the Belgian physician de l'Obel, who was drawn as a medical attendant by James I. to the British Court.

Sterculiaceæ derive their name from the leading genus Sterculia, which again arose from Roman Mythology and became conferred on the Sterculias on account of the unpleasant odor of some species.

Polypodium is the ancient Greek name of the most widely distributed European species, and obtained this designation on account of the numerous rootlets springing from the creeping main-root.

Hypolepis is so called, because the fruitmasses are concealed under scalelike reflexed lobules of the frond.

Lomaria, a word of Greek origin, is derived from the limb formed by the revolute margin of the frond over the fruitlines.

To the scenic liliaceous plants, mentioned at p. 119, may yet be added our East Australian Spearlily, Doryanthes excelsa.

APPENDIX.

SYSTEMATIC LIST OF ORDERS OF PLANTS, REPRESENTED AS INDIGENOUS IN THE COLONY OF VICTORIA.

I.—*Dicotyledonous plants with disunited or without petals* (Dialypetalæ or Choripetalæ).

Ranunculaceæ.
Dilleniaceæ.
Magnoliaceæ.
Nymphæaceæ.
Menispermaceæ.
Anonaceæ.
Monimiaceæ.
Lauraceæ.
Papaveraceæ.
Capparideæ.
Cruciferæ.
Droseraceæ.
Violaceæ.
Pittosporeæ.
Tremandreæ.
Polygalaceæ.
Hypericaceæ.
Elatinaceæ.
Linaceæ.
Geraniaceæ.
Malvaceæ.
Sterculiaceæ.
Tiliaceæ.
Zygophylleæ.
Rutaceæ.
Sapindaceæ.
Viniferæ.
Rhamnaceæ.
Celastraceæ.
Euphorbiaceæ.
Urticaceæ.
Amentaceæ.
Casuarineæ.
Stackhousiaceæ.
Frankeniaceæ.
Plumbagineæ.
Portulaceæ.
Caryophylleæ.
Salsolaceæ.
Ficoideæ.
Amarantaceæ.
Polygonaceæ.
Phytolacceæ.
Nyctagineæ.
Crassulaceæ.
Saxifrageæ.
Rosaceæ.
Leguminosæ.
Myrtaceæ.
Lythraceæ.
Haloragеæ.
Onagreæ.
Santalaceæ.
Loranthaceæ.
Proteaceæ.
Thymeleæ.
Umbelliferæ.
Araliaceæ.

II.—*Dicotyledonous plants with united petals* (Gamopetalæ).

Rubiaceæ.
Caprifoliaceæ.
Passifloreæ.
Cucurbitaceæ.
Compositæ.
Campanulaceæ.
Stylideæ.
Goodenoviaceæ.
Gentianeæ.
Loganiaceæ.
Plantagineæ.
Primulaceæ.
Myrsineæ.
Oleaceæ.
Apocyneæ.
Asclepiadeæ.
Convolvulaceæ.
Solanaceæ.
Scrophularineæ.
Orobancheæ.
Lentibularinæ
Gesneriaceæ.
Bignoniaceæ.
Asperifoliæ.
Labiatæ.
Verbenaceæ.
Myoporinæ.
Epacrideæ.
Ericaceæ.

III.—*Dicotyledonous plants without distinct calyx, style and stigma* (Gymnospermæ).

Coniferæ.

IV.—*Monocotyledonous plants.*

Orchideæ.
Irideæ.
Amaryllideæ.
Liliaceæ.
Philydreæ.
Xyrideæ.
Hydrocharideæ.
Alismaceæ.
Najadeæ.
Lemnaceæ.
Typhaceæ.
Palmæ.
Xerotideæ.
Juncaceæ.
Restiaceæ.
Eriocauleæ.
Centrolepideæ.
Cyperaceæ.
Gramineæ.

V.—*Acotyledonous plants.*

Characeæ.
Marsiliaceæ.
Isœteæ.
Lycopodiaceæ.
Filices.
Musci.
Lichenastra.
Lichenes.
Fungi.
Algæ.

Total of natural orders, 116.

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INTRODUCTION

TO

BOTANIC TEACHINGS

AT THE

SCHOOLS OF VICTORIA.

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